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International edition

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How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extent depend on the quality of the discoveries that you can make with your Dragon. The Dragon computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

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Editorial

LUCIDATA of Cambridge has a new interface for the Dragon which can fool it into thinking it's a BBC B.

What that means is that Dragon owners can make use of the wide variety of peripherals designed for the BBC.

Your Dragon can control a digitiser, a robot arm, a Penman plotter — the list is too long to go through here.

Compusense has produced a modem package with software which lets Dragon users contact bulletin boards, electronic mail services and Prestel.

Wintersoft — a company which has been silent far too long — is back with another game for the Dragon: and it sounds like it should be a winner, too.

But there are an awful lot of companies out there who used to be hard at work selling products for the Dragon who seem to have just disappeared.

Granted, many of them have run into financial difficulty and gone under — but a lot haven't. They have, quite simply, decided that Dragon software isn't worth their while doing any more, and have moved on to more profitable ventures.

All the more reason, then, why we should support those companies that still support us.

But it's difficult to work out which is worse — dropping out of the Dragon market because the potential profits are no longer large enough to satisfy, or staying in, continuing to work on the Dragon — but not telling anyone about it.

Every time a comment appears in *Dragon User* such as "why is nobody doing a disk doctor for the Dragon?" letters arrive from irate readers telling us all about various companies who are doing just that.

Somewhere there is a failure of communication.

If you have something for the Dragon, then tell us about it. You can't expect to sell products if you don't publicise them.

Our readers have been loyal to the Dragon for a long time — somebody should start doing something for them in return. Don't keep things to yourselves — Dragon owners need to know about the latest developments for their micro.

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Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Soundbox

RE "Soundbox" program by Pam D'Arcy in *Dragon User*, April 1985.

I own a Dragon 64 and find that the above program will operate on the machine when it is in 32 mode but not in 64 mode. This is apparently because the program calls up a routine at $BD41 which is relocated when the machine is in 64 mode.

As I wish to use the program in 64 mode, could you possibly tell me which address to substitute for $BD41? I should be most grateful.

Whilst writing, may I ask for your assistance on another Dragon program that I am having problems with? I refer to Knight Software's *Sprite Magic*, which I purchased some months ago but have only now started using.

According to the manual accompanying the program, drawing data is stored between &H6001 and &H6F7F (assuming "clear 200, &H6000"), giving over three K of memory for drawing data.

I am developing a program in PMODE 3 and find that *Sprite Magic* will not cope with five drawings of 72 bytes each (co-ordinates 0,0-23,23 in normal "non-Sprite Magic" terminology). As soon as I try to DGET the fifth drawing, the program reports "SM3 ERROR", ie all drawing space has been used up.

I have tried to contact Knight Software by telephone but can only get "number unobtainable".

D Swift
41 Headington Road
Maidenhead
Berks SL6 5LA

CAN anybody help Mr Swift with his Sprite Magic problem?

Beginners?

I AM the contented owner of a Dragon 32 and purchase *Dragon User* regularly.

I find the articles rather confusing for a beginner — is it really necessary to publish pages and pages of complicated programs? Do people really put them into their computers?

I would like to support a section for beginners, with really short programs for them to try.

I am so glad that you are flying the Dragon flag — it is a splendid machine — but *Dragon User* is far too complicated, in my opinion.

G R Guthrie
83 Woolbrook Road
Sidmouth EX10 9XD

Windows

CAN Phil Brooks provide us with the Source Code of the Writer program? I have found out that to prevent errors never to put a REM after an Input question, but these are only ripples in the fab Redesigner program.

Further I found out some fantastic effects in the program, let us have here a sample:

```
1 PMODE 2,1:PCLS:SCREEN1,1
2 WRITE@950,"DEMO All Chars";
3 FOR DELAY=1 TO 5000:NEXT DELAY
4 FOR CHARS=0 TO 122
5 FOR LOCATION=100 TO 500
6 ALHA$=CHR$ (A) :WRITE @ (LOCATION),ALPHA$
7 NEXT LOCATION
8 NEXT CHARS
```

A Van Wamelen
Dragon Users Club
Netherlands — Belgium
3 Lijnmetstraat
Dedelem 8330
Belgium

smashing!

IF ANY readers have not yet tried Brian Cadge's Windows program from July's issue, or thought the prospect of typing all those data statements a bit of a pane (*sic*), then I would ask them to reflect on their decision. Have a crack at it, it will throw a new light on your Dragon. (*really sic — Ed*).

By using WINDOW 0,0,31, 0,15,1 all printing to the screen is white on black — far less tiring on the old mince pies than the standard black on white, especially if, like me, you're a bit long in the tooth (over 30).

Also, by using several screens at once, the computer will give the illusion of carrying out different functions simultaneously.

I have written a program which divides the screen into four — all doing different things.

Screen one displays a timer or clock, screen two runs through the CHRs repertoire of the computer, screen three prints a conversion of decimal to hexidecimal values and screen four displays random random number up to 999 using the curostr function. The RND function in line 100 is to add to the illusion that the screen is performing simultaneous functions.

David Moore
Kilkhampton
Bude
Cornwall EX23 9QW

Delightful!

I AM delighted with the past few issues (May through August) of *Dragon User*. You finally admitted that Dragon DOS exists, and that you have some readers who are sick of games and want to use these powerful (and in Israel — expensive) machines for serious purposes. Please, lots more of Dragon DOS, OS9, Delta DOS, and FLEX.

My thanks to Pam D'Arcy for her excellent disassembler ("The Numbers Game", June 1985). It ran perfectly the first time. She is a meticulous programmer and excellent writer.

Line-by-line checksums are used in US magazines for program listings. Regular use of such a system, plus better editing, would reduce the number of unworkable listings you print.

A friend with a Dragon 32 and tape typed in "MOON MINER". Ran beautifully the first time. Of course, it doesn't run on my 64 with DOS plugged in. Please, tell me the changes necessary in the machine code to run it with Dragon DOS attached. My tape recorder broke down last year, never bothered to repair it after I bought a disk system.

It would be a big boost to your potential circulation if you gave program listings with versions for tape, Dragon DOS, Delta DOS, and FLEX. Some OS9 programs would also be good for those of us who spent so much on serious software to use the capabilities of the Dragon computer. You can have a wider circulation by offering more, especially to those who have disk systems and the high-priced software.

Harry C Taylor II
Rimon
Israel

OS9

I HAVE owned Dragons right from the beginning when Dragon Data first got going.

Right back in the early days, I had a small routine published in one of the inferior weeklies, for indexed tape loading. The offending publishers never actually paid me for this, despite a couple of letters to remind them. I vowed after this, on principle, not to write to a magazine again. However the time has now come to break my silence.

Over the past years, I have had great satisfaction from computing with Dragons, having written many disk loads of software, built eprom programmers, external rom boards, real time clocks etc. If you look at other computers, you will see that there are some excellent user groups around, but nothing for Dragon users. Take CPM, there is a wealth of software for machines running such, but not OS9. I think we should change this. I would be glad to hear from anyone who is interested in this, and if there is sufficient response, we should be able to get a UG going.

Does anyone know where and how the clock module is linked into OS9, as I know there is provision for a real-time clock? Does anybody know if there is a suitable modem package on the market (I am sure this will cost less than a home brew)? Also does anyone know of a good communications package for serial links? Finally, I have just spent a lot of time converting 32 disk software by putting an acia on the 32 and transferring the program serially to an OS9 text file where it can be modded with stylograph and compiled by Basic09. If anyone wants to drop me a line they will be very welcome (I would appreciate a return stamp) and I will give them further details.

Martin Vernon
4 Roseberry Court
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Gwynedd LL30 1TF

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Dragon claws BBC B

THE DRAGON'S Claw is a new digital interface for the Dragon, which enables it to control peripherals designed for the BBC B.

Fitting into a standard cartridge box, the Claw, designed by Lucidata of Cambridge, includes two full specification eight bit ports, internal timer and serial to parallel convertor. It also replicates the Dragon's expansion slot connector, which means that other peripherals can be connected to the micro at the same time — games cartridges, disk controllers, or editor/assemblers.

More than one Claw can be used at once — up to four can be stacked up, all with separate addresses.

The Claw is compatible with Flex, Dragon Dos and others.

Lucidata is also offering the Micro Robotics Snap camera, which lets users digitise pictures, store them or play around with them to produce some very interesting effects, under the name Snap Dragon.

Many other BBC B peripherals will be converted to Dragon use in the future, including a three axis Robot Arm. Lucidata will be demonstrating the Claw, Snap Dragon, and other developments at the Third 6809 Show in November.

The Dragon's Claw costs £30, and the Snap camera £130, excluding VAT and postage and packing. Both are available, mail order only, from Lucidata, PO Box 128, Cambridge CB2 5EZ.

Sprites and Demons

J MORRISON (Micros) of Tingley, West Yorkshire, has two new products on cartridge for the Dragon.

The first is an Animated Sprite Generator/Scenario Generator. Three are some 40 or 50 different commands, which enable the user to create 90 distinct types of sprite. There are facilities to change direction and movement of sprites, and even to change fonts when the sprite collides with another object — so that a monster could change shape when shot, for example.

The other product is a Demon Development Cartridge. It is an editor assembler, monitor and disassembler, with 17 commands on the monitor side and 15 on the assembler.

Both cartridge utilities cost £19.95 each from J Morrison (Micros), 4 Rein Gardens, Tingley, West Yorkshire WF3 1JR.

Cumana in Spain

CUMANA, the disk drive manufacturers, has appointed a distributor to take advantage of the growing market for Dragon peripherals in Spain.

CAT Espana, a company specialising in the export and import of high technology equipment, will act as Cumana's agent within Spain.

Eurohard, the Spanish company which now makes the Dragon, is attempting to promote it — as the Dragon 200E — as the perfect micro for schools, in the same way as the BBC B was adopted by British educational establishments.

To use Cumana disk drives, Dragon owners need a disk controller, which operates under Cumana DOS, a Dragon compatible operating system built into ROM.

Dragon DISK DRIVE micro

The disk drives themselves come in a wide variety of types. Users can opt for 40 or 80 track, double or single sided 5¼in or 3½in disks.

Cumana is at Pines Trading Estate, Broad Street, Guildford, Surrey GU3 3BH.

Impish

IMPSOFT has reduced the price of *Chicken Run* and *Fruity* to £2.95 each and £4.95 for the pair.

Norman Silver, Impsoft's managing director, claimed that the reductions are being made to clear out stock levels "prior to Impsoft's new Dragon releases in the autumn". However, he was unwilling to say what those new releases were.

He did state that the new products would combine software and hardware, and would be ready in time for Christmas. "It's expensive to develop," he said, "so we need some money right now."

Impsoft is at 149 Balham Hill, London SW12 89DJ.

Wintersoft return

WINTERSOFT, the company which published the classic Dragon games *The Ring of Darkness* and *Return of The Ring*, is working on a new graphical adventure but spokesman John Humphreys said very definitely 'it's not part three of the Ring cycle."

The new game is called *Juxtaposition*, and is really two games in one. In the first, which has a science fiction setting, the player is searching for the key word which will allow passage into the second game, which has a fantasy plotline.

"The graphics will be similar to those used on Beyond's *Lords of Midnight*," said John. "In each location, you will be able to look in eight directions, and you will see a coherent landscape."

There will be 4,000 locations in each game, which makes a total of 64,000 views. Over 2,000 of the locations will be described at length in text.

***Juxtaposition* is scheduled for release at the end of September, and will probably cost £6.95.**

Contact Wintersoft at 30 Uplands Park Road, Enfield, Middlesex EN2 7PT.

Compuchat

COMPUSENSE is to release a communications program, called *Chat*, and a complete communications package for the Dragon which will enable users to contact bulletin boards, Prestel, Telecom Gold and a new service, One-To-One.

The software for *Chat* will cost £6.95, and Com- special deal — modem, modem ca[illegible] and *Chat* — for £85.

In addition, *Chat* can also be used to turn a Dragon 64 into a terminal, working at up to 19,200 baud rate.

***Chat* comes on cassette, or it can be supplied for Dragon DOS, Cumana DOS, Delta DOS or Flex with DBasic.**

One-To-One is a new electronic messaging system which Compusense is supporting. It offers a wide variety of facilities, including instant mail, priority and courier letters, radio paging and a worldwide Telex service.

Contact Compusense for more information on *Chat* and One-To-One at PO Box 169, 286D Green Lanes, London N13 5XA.

Basic Basic for your Dragon

***Iolo ap Gwyn** has some basic advice for beginners on how to tidy up your listings*

MUCH HAS been said and written about the strengths and weaknesses of the Dragon. One of its strengths is its ease of programming, with a particularly powerful version of BASIC. In addition it has, arguably, the nicest of all 8-bit microprocessors to program in assembly language, the Motorola 6809. This makes it a very good machine for people to learn the principles of programming on. The BASIC, incidentally, is very similar to that used on the IBM PC and the Amstrad.

However, when writing programs in BASIC it is possible to get into a terrible tangle and produce what is known in the trade as "spaghetti" programming. This is one of the reasons why many computer science purists regard it with some disgust, and even suggest that children should not learn how to use it as its use would create bad habits. The fact remains that it is still one of the most popular of the high level programming languages and is invariably the first to be supplied with any new micro.

"First attempts tend to run rather slowly"

When a microcomputer like the Dragon is working in BASIC through its own BASIC interpreter, most people's first attempts at programming tend to result in games that run rather slowly. This can be a very frustrating experience if you have spent quite some time planning and writing your program.

One approach to speeding matters up is to buy a BASIC compiler, which converts your BASIC program, which must have been completely debugged, into a machine code program. This is then saved as a machine code program and can be subsequently loaded and run as a machine code program. This speeds up the action by a factor of as much as 10 or more, because the microprocessor in the computer acts directly upon the machine code instructions as this is the only language it understands. No time consuming intermediate stages are involved.

The reason for the difference in speed is that when a BASIC program is being run through the interpreter, which is held in the permanent ROM of the computer, each time an instruction is called the computer has to search through the interpreter for the machine code routine to carry out that instruction. But this is not necessary when the BASIC instruction has already been converted into machine code by a compiler before the program is run. For this, and many other reasons compiling programs makes them run much faster.

Careful planning and writing of the program makes possible a significant speeding up of the original BASIC program without the need for a compiler. Not that this approaches the speed of a compiled program, but very often it adds just that extra speed which can make the difference between the program being usable or not. A well-organised program will also run even faster if it is compiled. In addition the practices it encourages lead to easier programming, and the use of parts of programs as a basis for other future programs, thereby saving you a deal of unnecessary programming. This is the way that the professional programmer works, having a library of subroutines to draw upon.

The first thing we must do is to plan the program very carefully into modules or subroutines. The main program then makes use of the subroutines when needed. The best place to put these is at the beginning of the program, the more commonly used ones coming first. This means that whenever the GOSUB instruction is given the program only has to run through a few program lines to find the called line number.

Such "structured" programming is always good practice. It is much easier to follow the program in the event of any "bugs" appearing, and adjust variables and other values in order to get the program to do exactly what you require. Also once you have written a routine to do a particular task in one program it could then easily be used in another program should you wish the same kind of task performed again. It is also much more efficient in the use of computer memory, as a well-written program can be as much as half as long as a non-structured example. An added benefit to this approach is that it may be much easier to modify the program to run in different versions of BASIC, should you wish to transfer it to another type of computer.

"Careful planning adds extra speed"

In order that I can demonstrate exactly what this means, let us look at an example. Three examples of a short program to draw a few circles are given. All of them do the same job, but in a fundamentally different way:

Example 1 — A non-structured program

```
10 PMODE4,1:SCREEN1,1:PCLS
20 CIRCLE(125,95),20
30 CIRCLE(125,95),40
40 CIRCLE(125,95),60
50 CIRCLE(125,95),80
60 GOTO 60
```

Example 2 — A structured approach to the same task

```
10 PMODE4,1: SCREEN1,1: PCLS:
   GOTO 30
20 CIRCLE(125,95),R:RETURN
30 R=20:GOSUB 20
40 R=40:GOSUB 20
50 R=60:GOSUB 20
60 R=80:GOSUB 20
70 GOTO 70
```

Example 3 — An even better approach

```
10 PMODE4,1: SCREEN1,1: PCLS:
   GOTO 30
20 CIRCLE(X,Y),R:RETURN
30 X=125:Y=95
40 FOR R=20 TO 80 STEP 20
50 GOSUB 20
60 NEXT R
70 GOTO 70
```

In line 20 there now exists a subroutine to draw a circle at any time one is needed without having to enter the whole instruction at each point in the program. All that has to be done is to set the values for the variables, and call the subroutine. This is a very simple example, but it demonstrates the principle behind this approach to doing things.

In some other high level languages, such as PASCAL, you are forced to work in such a manner. This is why many purists favour its use. Similar techniques are also required for successful Assembly language programming. The approach used is therefore to prepare subroutines to do various tasks required in the program, and then to call them when they are needed from the main program. Careful planning usually means that certain commands are only entered a few times in a whole program, whereas the GOSUB command works overtime!

In some versions of BASIC, such as BBC BASIC, there is also the PROCEDURE which does a similar job, and makes structured programming even easier, because each subroutine or procedure can be given a name instead of a line number. Structuring will lead to faster, shorter programs, but by far the greatest speeding up is achieved by being careful in the way use is made of certain commands.

By measuring the time the computer takes to complete various tasks it is possible to find out the most efficient approach to writing code. With the Dragon it is possible to experiment in order to find out how long it takes to perform tasks by using the TIMER command.

One method of speeding things up considerably is by using IF THEN ELSE, conditional statements. If variables, which have been preset, are used instead of constants then we observe a dramatic increase in the speed of the program. This increase is as much as achieved by using the notorious "high speed POKE" which appeared to work quite well on some machines, particularly those of an earlier vintage! The reason for this is that each time the interpreter meets a constant it has to calculate its value and place it in the appropriate register. However, a variable which has already been set only requires the interpreter to look up the register to find the required value. This latter process takes up far less cycles of the microprocessor operation and hence is much faster. This is one of the reasons why structured programming works faster — you are forced to use variables instead of constants.

Take the following simple example to illustrate the point:

```
10 TIMER=0
20 FOR I=1 TO 10000
30 IF I=10000 THEN PRINT TIMER:
END
40 NEXT
```

Running this program on my Dragon gives a TIMER value of 4472. Modifying this short program in the following manner reduces this value to 2243, virtually a halving of the time taken!

```
 5 MAX=10000
10 TIMER=0
20 FOR I=1 TO 10000
30 IF I=MAX THEN PRINT TIMER: END
40 NEXT
```

A further speeding up can be achieved by substitution of the 10000 in line 20 by MAX as well, but not such a dramatic saving as with the IF THEN statement. Similar small savings can be made in most commands, especially graphics ones. The amount saved can vary between 5 and 25 per cent per command.

> *"Structuring will lead to faster, shorter programs"*

The following example shows how some speeding up of the LINE command can be obtained in this way:

```
10 PMODE4,1:SCREEN1,1:PCLS
20 TIMER=0
30 FOR I=1 TO 191
40 LINE(0,85) - (255,I),PSET
50 NEXT
60 PRINT "TIME= ";TIMER
                              (TIME=767)
```

Edits:

```
 5 Z=0:Y=85:X=255
40 LINE (Z,Y) - (X,I),PSET
                              (TIME=720)
```

If the program allows it, an appreciable amount of time can be saved when using FOR — NEXT loops by leaving the variable out of the NEXT statement. For example, instead of writing FOR I=0 TO 10000:NEXT I, we substitute FOR I=0 to 10000: NEXT. This must be done carefully, especially if you jump into subroutines which themselves contain other FOR — NEXT loops. If this occurs things can get ever so complicated and you will probably need to use the TRON tracing facility to sort out exactly what is happening!

One useful piece of information which can save a lot of programming time, and as far as I know has not been documented for the Dragon is that the MID$ command can be used in two ways. This is part of its standard MICROSOFT function, but seems to have been left out of the Dragon documentation. The standard use of MID$, as documented, is in asking a question of a part of a string such as in IF MID$(STRING$,3,3)="BOX"THEN and so on. It can, however, be used the other way around, like MID$(STRING$,3,3)="BOX", so that new substrings can be assigned to the middle of larger strings. Those strings must, however, exist, as this instruction cannot create a new string by itself.

There is another way of obtaining an IF — THEN condition, other than the conventional way. Where the result of the conditional statement affects an arithmetic calculation it is possible to dispense with the IF and so on. This is done by virtue of the fact that the computer assigns a value to a statement such as A=B or A>C. If the condition is true then it registers as −1, if false then as a 0. The following example will serve to illustrate:

Normal approach

```
10 IF A=B THEN A=B*100
20 IF A>C THEN A=C*1000
30 A=A+B+C
```

Alternative approach

```
10 A = (-1*B*100*(A=B))+
   (-1*C*1000*(A>C))+B+C
```

The whole process is accomplished in a single statement. If you wish to work it out for yourself just take each part of the statement at a time and think about exactly what is happening, remembering that true gives −1, false 0 and what happens when you multiply by 0 or multiply two negative numbers together.

Once the program has been written and debugged, it is then possible to speed things up, as well as save on memory, by removing REMs and forming multi-statement lines. This also makes it dreadfully difficult for anyone else to work out how your program works, but remember to keep an unedited version for your own future reference!

Although the sensible use of REMs is essential in a good program, so that us mere humans can follow what is going on, once the program is running and does not need further editing then they can be removed. This exercise must be done very carefully because any lines containing directions to GOSUB or GOTO line numbers must have a line number to jump to. Having access to a word processor, such as the Dragon *Superwriter* or the *Telewriter* makes light work of this job. Searching facilities can be used to check the line numbers associated with GOTO or GOSUB commands.

In Simon, the demonstration program which follows many of the suggested practices have been incorporated. You may wish to experiment by changing it yourself, so the final stripping of REMs and compression of lines has not been done. The program, called SIMON after the popular game, also makes use of the very useful PCOPY command, which as far as I can tell is unique to the Dragon and TRS80 BASIC. It enables the programmer to switch between any of the eight high resolution graphics screens.

If, as is done in this program, they are set up beforehand the display that they contain can be switched instantly on to the screen when needed.

Speeding up of the setting up of the graphics pages was achieved by placing all of the constants and strings in DATA statements at the end of the program. All of the subroutines are set out in lines 70 to 730. The game is all run between lines 760 and 980.

It is quite easy to follow what is going on in this program because of the way it is laid out.

So, by following fairly simple rules it is possible to write more satisfactory programs and spend much less time debugging "spaghetti", which need yards of paper to print them out on. As with using any type of language, be it human or computer, there is much more to it than simply learning the meanings of words.

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```
10 CLEAR200:PCLEAR8
20 CLS:PRINT@8+(5*32),"simon"
30 PRINT:PRINT:PRINT">>>>setting up>>>wait!"
40 PRINT@15*32,"c I.ap Gwynn,2/85"
50 GOTO470
60 '
70 ' SUBROUTINES
80 '
90 'PRINT LINE SUB
100 FOR I=1 TO LEN(LI$)
110 DRAW"BM"+STR$(X)+","+STR$(Y)+"S"+STR$(S)+A$(ASC(MID$(LI$,I,1))-32)
120 X=X+XS
130 NEXT:RETURN
140 '
150 'DRAW BORDER SUB
160 LINE(I,I)-(255-I,95-I),PSET,B
170 LINE(I,I+95)-(255-I,191-I),PSET,B
180 RETURN
190 '
200 'DELAY SUB
210 FORI=0TO2000:NEXT: RETURN
220 '
230 'CORRECT ANSWER SUB
240 FOR I=1 TO NP:POKE 1024+PO(I,0),PO(I,1):NEXT
250 GOSUB210
260 PCOPY8TO5:PCOPY7TO8:PCOPY6TO7:PCOPY8TO6
270 RETURN
280 '
290 'INCORRECT ANSWER SUB
300 LINE(0,0)-(255,95),PRESET,BF
310 X=40:Y=20:S=8:XS=16:LI$="INCORRECT!":GOSUB100
320 X=40:Y=55:LI$="Start again!":GOSUB100
330 X=40:Y=85:LI$="Score="+STR$(LEN(AN$)-1):GOSUB100
340 FORP=0TO20:SOUND10,1:SOUND20,1:NEXTP
350 GOSUB210
360 PCOPY8TO5:PCOPY7TO8:PCOPY6TO7:PCOPY8TO6
370 SQ$="":RETURN
380 '
390 'COMPLETE SET SUB
400 SCREEN0,1:CLS0:PRINT@(5*32)+5,"TWENTY CORRECT!!":GOSUB 210
410 FORX=1024TO1535:POKEX,RND(255):SOUNDRND(255),1:NEXTX
420 PCOPY8TO5:PCOPY7TO8:PCOPY6TO7:PCOPY8TO6
430 SQ$="":RETURN
440 '
450 'END OF SUBROUTINES
460 '
470 SQ$="":AN$=""
480 DIM A$(90)
490 'SET UP CHARACTER STRING ARRAYS
500 FOR I=1 TO 43: READ N,A$(N): NEXT
510 'SET UP CORRECT ANSWER ARRAY
520 READ NP: DIM PO(NP,2)
530 FOR I=1 TO NP: READ PO(I,0),PO(I,1): NEXT
540 '
550 'SET UP GRAPHICS PAGES
560 '
570 J=4:FOR I=1TO4
580 PMODE1,I: PCLSI:COLORJ
590 DRAW"BM100,80;S32"+A$(ASC(MID$(STR$(I),2,1))-32)
600 J=J-1
610 NEXT
620 '
630 'PREP INSTR
640 PMODE1,5:PCLS3:COLOR2,3
650 FOR I=0TO10: GOSUB160: NEXT
660 X=20:Y=70:S=32:XS=40:LI$="READY": GOSUB100
670 X=30:Y=130:S=8:XS=12:LI$="Simon says....": GOSUB100
680 X=30:Y=160:LI$="Look & Listen!": GOSUB100
```

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```
690 PMODE1,7:PCLS3:COLOR2,3
700 FORI=0TO10: GOSUB160: NEXT
710 X=30:Y=40:LI$="Simon says...": GOSUB100
720 X=30:Y=70:LI$="repeat now..:": GOSUB100
730 '
740 'RUN GAME
750 '
760 PMODE1,5:SCREEN1,0
770 GOSUB200
780 PCOPY5TO8
790 SQ$=SQ$+MID$(STR$(INT(RND(4))),2,1)
800 FORI=1TOLEN(SQ$)
810 PCOPY VAL(MID$(SQ$,I,1)) TO5
820 SOUND VAL(MID$(SQ$,I,1))*50,20-LEN(SQ$)
830 NEXT
840 PCOPY8TO5:PCOPY6TO8:PCOPY7TO6:PCOPY8TO7
850 PMODE1,5:SCREEN1,0
860 PCOPY5TO8
870 FORI=1TOLEN(SQ$)
880 IN$=INKEY$:IF IN$="1" OR IN$="2" OR  IN$="3"  OR  IN$="4"  THEN890
ELSE 880
890 PCOPY VAL(IN$)TO5
900 SOUND VAL(IN$)*50,20-LEN(SQ$)
910 AN$=AN$+IN$
920 NEXT
930 IF AN$=SQ$ THEN 940 ELSE 960
940 IF LEN(AN$)=20 THEN 970 ELSE SCREEN 0,1:CLS0
950 GOSUB 240:GOTO980
960 GOSUB 300:GOTO980
970 GOSUB 400
980 AN$="":IN$="":GOTO 760
990 '
1000 'CHARACTER STRINGS
1010DATA0,BR7,1,BR2R0BU2U4,6,BR1R0R1E2BD2D0H3E2H1L1G1F1D1G1D1F1,14,BR2
R0U1R1D1L1,16,BU1U0U4E1R2F1D4G1L2H1F1U1E1U2E1U1,17,BR1R0R2L1U6G1,18,R0
R4L4E4U1H1L2G1,19,BU1U0F1R2E1U1H2E2L4,20,BR3R0U6G3D1R4,21,BU1U0F1R2E1U
2H1L3U2R4
1020DATA22,BR1R0R2E1U1H1L3E3G3D2F1,23,U0U1E2L1R2L1E2U1L4,24,BR1R0R2E1U
1H1L2H1U1E1R2F1D1G1L2G1D1F1,25,BR1R0E3U2H1L2G1D1F1R3,26,BR1R0R1U1L1D1B
U3U0U1R1D1L1,29,BU2U0R4BU2U0L4,33,U0U4E2F2D4U2L4,35,BR1R0R2E1BU4U0H1L2
G1D4F1
1030DATA36,R0R3E1U4H1L3R1D6,37,BR4R0L4U3R3L3U3R4,41,R0R4L2U6L2R4,44,BR
4R0L4U6,46,U0U6F2D2F2U6,47,BR1R0R2E1U4H1L2G1D4F1,50,U0U6R3F1D1G1L3R1F3
,51,BU1U0F1R2E1U1H1L2H1U1E1R2F1,52,BR2R0U6L2R4,57,BR2R0U3H2U1D1F2E2U1
1040DATA65,BU4BR1R0R2D3G1L1H1E1R1F2,67,BR3R0L2H1U2E1R2,69,BR3R0L2H1U2E
1R2F1D1L4,71,BD2D0R3U6L2G1D2F1R2,73,BR1R0R2L1U4L1BU2BR1R0,75,U0U6D4R1E
2G2F2,77,U0U3E1R1D4U4R1F1D3,78,U0U4R2F1D3,79,BR1R0R2E1U2H1L2G1D2F1
1050DATA80,R0R2E1U2H1L2D6,82,U0U4F1E1R1,83,R0R3E1H1L2H1E1R2,84,BR3R0L1
H1U5D2L1R3,87,BU4U0D3F1E1U1D1F1E1U3,89,BD2D0E3U1E1U1BL4L0D1F1D1F1
1060 'CORRECT ANSWER PAGE
1070DATA130,33,129,34,140,35,137,52,138,55,133,65,133,68,129,69,140,70
,137,71,132,72,134,73,137,74,132,75,134,76,137,77,129,78,140,79,137,80
,129,81,140,82,137,83,132,84,142,85,136,87,133,97,133,99,129,100,133,1
02,133,104,138
1080DATA107,138,109,133,110,140,111,136,112,133,114,129,116,138,117,12
9,119,133,130,140,131,136,133,140,134,136,136,136,139,136,142,140,143,
136,145,140,146,136,148,132,149,136,151,132,183,132,197,131,198,130,20
7,129,228,133,230,132
1090DATA232,131,233,130,235,131,236,130,238,131,239,135,260,133,261,12
9,262,131,263,133,265,133,266,133,268,133,269,133,271,133,292,132,293,
131,294,135,295,132,296,131
1100DATA297,134,298,132,299,131,300,134,301,132,302,131,303,135,305,12
9,308,129,311,129,388,149,389,146,391,149,393,150,394,156,395,156,396,
146,397,149,400,149,420,149,421,148,422,146,423,149,425,154,428,154,42
9,149,431,146,432,149
1110DATA452,149,454,148,455,151,457,154,460,154,461,149,462,150,463,14
8,464,151,466,147,468,145,469,146,471,147,484,148,487,148,489,148,490,
156,491,156,493,148,496,148,498,154,500,148,501,152,503,154
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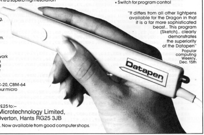


Zippy titles!

***Brian Hinson** shows you how to add some zip to your programs with a routine which designs text screens*

You may well have written a brilliant program that you, and maybe your family, have great fun with. What happens when a stranger comes to have a go? Can he understand it? Is he attracted to it even while it is still loading in from tape?

Well, I have developed two simple utilities. One allows you to create text screens direct from the keyboard using all 256 possible characters. The other provides a snappy display of text for use as instructions or information. To see all 256 ASCII characters try this:–

```
10 CLS
20 FOR A=0 TO 255
30 POKE 1024+A,A
40 NEXT A
50 GOTO 50
```

If you have already used my Artist program, published in *Dragon User*, April 1985, to create machine code listings for your graphic screens you may like to consider this idea. Record the following simple Basic program at the beginning of a new tape, followed by a machine code title page, then the graphics produced with Artist. Right after that, record a second title page and then your main program.

```
10 CLOADM "TITLE 1"
20 CLOADM "GRAPHICS"
30 CLOADM "TITLE 2"
40 CLOAD "MAIN PROG."
```

Rewind the tape and type <CLOAD>. Very shorty the <OK> prompt will appear. Now <RUN> and instead of the standard boring green screen with flashing "F", you produce a full colour introduction screen while the computer quietly loads in the graphics. Next a new instruction screen appears while the main Basic program loads.

The listing below will allow you to make machine code recordings of text screens in full nine colour graphic blocks plus all ASCII characters direct from the Dragon keyboard.

By way of explanation of this program and also to illustrate a way of producing multiple text displays for complex utility instructions or educational programs, I have included my Flashy Instructions routine from line 860 to line 1110.

The text screen is cleared to black and the number of lines to be displayed (maximum 16), is read in from data. C$ and D$ are for decoration, and if used count as one line each. (They produce black and orange lines respectively in screen 0,1). The core of this routine is in lines 900 to 960. Each line of data is read, and spaces are added to each end until the text fits centrally. By switching to Screen 0,1 rather a pleasant effect is obtained. The program then waits at line 990 until the "user" is ready.

If you want to save this subroutine separately DELete the lines up to and including 850. DELete lines 1020 onwards and substitute:

```
1020 ' * DATA LINES SHOULD START
1030 ' * WITH A NUMBER (MAX 16)
1040 ' * C$=BLACK D$=ORANGE LINE
1050 ' * MAX LINE LENGTH=32
```

This will remind you how to fill it up when you want to use it again.

The main "Zippy Title" program really starts at line 80 but note line 60 where the number of pages of script in the "Flashy Instruction" routine is set to 5. (AA=0 to 4. NOTE: In a different program you may well want the pages to come up after parts of the program have run through; just insert GOSUB**** when the next page is required). Having set the background as required, your keyboard is like a normal typewriter in that each key produces "lower case" letters unles <shift> is pressed for "upper case". You will have a normal cursor at this stage and you can move it around the screen by use of the arrow keys, without disturbing anything.

At this stage it is not possible to obtain the reverse for the shifted characters like "+", or the "normal" numbers, but these are available. Let's deal with normal graphics blocks first. Graphics are obtained by pressing <shift> and <0> together (the shift-lock). The cursor will change to green. Now the letters A-P will give you green blocks from solid black to solid green (see the chart below). Press "Z" and you advance through the colours one by one. At each stage the full 16 blocks are available and the cursor will blink in the appropriate colour. See the chart at the foot of the page.

If you press "Z" when your cursor is orange you will move into the "double reverse mode". Now the following relationship is active and these keys all print inverse characters:

A = SQ.BRKT.OPEN B = REV./
C = SQ.BRKT.CLOSE D = UP ARROW
E = LEFT ARROW

G = ! H = " I = £ J = $ K = %
L = & M = ' N = (O =) P = *
Q = + S = < T = = U = > V = ?
R = The record to tape routine is activated.

These keys all print normal characters:

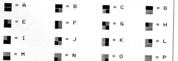
W = @
! = SQ.BRKT.OPEN. " = REV./
£ = SQ.BRKT. CLOSE $ = UP ARROW
% = LEFT ARROW

All the number keys and the lower split keys like "=" produce their respective "normal" characters.

The cursor in this mode is a reverse hash sign which my printer will show as "£", a pound sign. (Note this in line 1060). At any time you may return to normal type by cancelling the "shift-lock". (press <shift> and <0> together).

When you are ready you can move into the "Record" routine from Graphics mode by pressing "R". Instructions will appear at the top of the screen showing you how to save your creation. Note that although the full eight character title is available you may have any smaller title by pressing <enter>. Also remember that the title will be recorded in "lower case".

Graphic block chart.



IF YOU don't fancy typing in the listing, then send £2.00 to Brian Hinson, 67 Mellstock Road, Aylesbury, Bucks HP21 7NX and I will send you a tape containing Zippy on one side and Artist on the other.

```
10 DIM H1(32)
20 CLS0 : B$=CHR$(128) : C$="if"+B$+"you"+B$+"would"+B$+"like"+B$+"instructions"
 : D$="press" : E$="i" : F$="otherwise"+B$+"press"+B$+"any"+B$+"other"+B$+"key"
30 PRINT @ 161,C$; : PRINT @ 206, D$; : PRINT @ 240, E$; : PRINT @ 289, F$;
40 SCREEN0,1
50 S$=INKEY$ : IF S$="" THEN 50
60 IF S$="I" THEN FOR AA=0 TO 4 : GOSUB 860 : NEXT AA : A=0
70 A$="" : B$="" : C$="" : D$="" : E$="" : F$="" : S$=""
80 CLS : PRINT @ 32,"WHAT BACKGROUND COLOUR WOULD YOULIKE?"
90 FOR X=0 TO 8 : PRINT" FOR ";
100 FOR Y=1 TO 5
110 IF X=0 THEN Z=1 ELSE Z=0
120 PRINT CHR$(127+Z+(16*X));: NEXT Y : PRINT " PRESS ";: PRINT X : NEXT X
130 X=0 : Y=0 : Z=0
140 S$=INKEY$ : IF S$="" THEN 140
150 S=ASC(S$)-48 : CLSS : S=0
160 P=1024 : P1=1024 : Z2=32
170 SOUND 10,2
180 C=PEEK(P):POKE P,Z2
190 IF PEEK(&HFF00)<95 THEN CC=1 ELSE CC=0
200 PLAY "P48"
210 IF PEEK(&H149)=0 THEN Z2=143 +(16*Z) : Z3=1 ELSE Z3=0 : Z2=32
220 IF Z=8 AND Z3=1 THEN Z2=35
230 K$=INKEY$:IF K$="" THEN POKE P,C : GOTO 180
240 POKE P,C
250 A=ASC(K$)
260 P=P1:IF A=94 OR A=95 THEN P=P-32 : GOSUB710 : GOTO 180
270 IF A=10 OR A=91THEN P=P+32:GOSUB710: GOTO 180
280 IF A=8 OR A=21 THEN P=P-1: GOSUB 710: GOTO 180
290 IF A=9 OR A=93 THEN P=P+1: GOSUB 710: GOTO 180
300 IF Z3=1 THEN 420
310 IF CC=1 THEN 380 ELSE 330
320 '***TO PRINT lower CASE
330 IF A<64 THEN B=A
340 IF A=64 THEN B=0
350 IF A>64 THEN B=A-64
360 GOSUB 520 : GOTO 180
370 '****SHIFT-BUTTON PRESSED**
380 IF A<64 THEN B=A+64
390 IF A>63 THEN B=A
400 GOSUB 520 : GOTO 180
410 '***SHIFTLOCK ON-PRINT COLOUR
420 IF K$="z" THEN Z=Z+1
430 IF K$="r" THEN GOSUB 1110 : GOTO 180
440 IF Z=8 THEN Z2=35 : GOTO 760
450 IF Z>8 THEN Z=0 : Z2=143 : GOTO 180
460 IF K$="z" THEN Z2=143+(16*Z) : GOTO 180
470 IF A<97 OR A>112 THEN SOUND 50,5 ELSE 500
480 H2$="NOT AVAILABLE: A-P ; 'Z' OR 'R'"
490 GOSUB 600 : GOTO 420
500 B=128+(A-97)+(Z*16)
510 GOSUB 520 : GOTO 180
520 'SUB TO PRINT ON SCREEN
530 IFB<0 OR B>255 THEN SOUND 40,5 ELSE 560
540 H2$="NOT AVAILABLE TRY AGAIN"
550 GOSUB 600 : RETURN
560 POKE P1,B : SOUND 10,1
570 P=P+1
580 GOSUB 710
590 RETURN
600 'SUB TO GIVE HELP
610 FOR H=1024 TO (1024+32)
620 H1(H-1024)=PEEK(H)
630 NEXT H
640 PRINT@0, H2$
650 K$=INKEY$ : SOUND200,1:IF K$="" THEN 650
660 A=ASC(K$)
670 FOR H= 1024 TO (1024 +32)
680 POKE H,H1(H-1024)
690 NEXT H
```

```
700 RETURN
710 'SUB TO STAY ON SCREEN
720 IF P<1024 THEN P=P1
730 IF P>1535 THEN P=P1
740 P1=P
750 RETURN
760 '**print rev char't rs**
770 IF K$="z" THEN 180
780 Z2=35
790 IF A=119 THEN B=64 : GOTO 850
795 IF A<38 THEN B=A+58 : GOTO 850
800 IF A>43 AND A<60 THEN B=A+64 : GOTO 850
810 IF A>113 THEN 830
820 IF A<114 THEN B=A-70 : GOTO 850
830 IF A<119 THEN B=A-55 : GOTO 850
840 B=A+3
850 GOSUB 520 : GOTO 180
860 '**instructions subroutine***
870 CLS0:READ D
880 B$=" ":C$=" "+STRING$(30,CHR$(128))
890 D$=" "+STRING$(30," ")
900 FOR A=1 TO D
910 READA$
920 IF A$="C$" THEN A$=C$
930 IF A$="D$" THEN A$=D$
940 B=32-LEN(A$)
950 IF B>2 THEN A$=B$+A$+B$:GOTO940
960 PRINT A$:A$="":NEXT A
970 PRINT@482,"PRESS ANY KEY TO CONTINUE.";
980 SCREEN0,1
990 K$=INKEY$:IF K$="" THEN 990
1000 RETURN
1010 'data follows.
1020 DATA 14,ZIPPY TITLES,C$,D$,YOU WILL BE ASKED TO CHOOSE THE,BACKGROUND COLOU
R FIRST AND,THE SCREEN WILL BE CLEARED,TO THAT COLOUR.,AT THIS STAGE YOU WILL,HA
VE A NORMAL BLACK CURSOR.,THE KEYBOARD WILL PRODUCE ,REVERSE CHARACTERS like thi
s.
1030 DATA IF YOU WANT NORMAL CHARACTERS,USE <SHIFT> LIKE A TYPEWRITER.,D$
1040 DATA 15,C$,WHEN YOU WANT TO USE,dragon's,GRAPHIC BLOCKS USE THE,SHIFTLOCK B
Y PRESSING,<SHIFT> AND <O>.,C$,NOW YOU HAVE A GREEN CURSOR.,TYPE THE LETTERS A-P
,AND YOU WILL OBTAIN GREEN BASED,GRAPHICS.,EACH TIME YOU TYPE 'Z' dragon,CHANGES
 COLOUR M
1050 DATA THROUGH ALL 8 COLOURS.,C$
1060 DATA 12,D$,C$,D$,PRESS 'Z' AGAIN & YOU MOVE,INTO <DOUBLE> REVERSE MODE.,THI
S MODE ALLOWS YOU TO OBTAIN,THESE !"#$%&'()*=+?>< SYMBOLS,but in reverse,AND NOR
MAL NUMBERS 0-9,D$
1070 DATA C$,D$
1080 DATA 14,D$,C$,C$,IF YOU PRESS 'Z' AGAIN YOU,RETURN TO GREEN GRAPHICS,AND SO
 ON THROUGH THE COLOURS.,AT ALL TIMES THE ARROW KEYS,WILL MOVE THE CURSOR,WITHOU
T INTERFERING,WITH YOUR SCREEN,D$,C$,C$,D$
1090 DATA 14,D$,WHEN YOU ARE READY,(IN GRAPHIC MODE ONLY),PRESS 'R' TO RECORD YO
UR,"ZIPPY TITLE.",C$,ERROR MESSAGES AND HELP,WILL APPEAR AT THE TOP OF,THE SCREE
N,(WITHOUT DESTROYING YOUR DESIGN),ready,here qoes
1100 DATA D$,D$
1110 '***SUB TO RECORD********
1120 ZZ=Z2
1130 MOTOR ON
1140 H2$="PRESS 'R' WHEN TAPE IS READY."
1150 SOUND 200,10 : GOSUB 600
1160 IF K$<>"r" THEN 1140
1170 MOTOR OFF
1180 H2$="MAX 8 CHARACTER TITLE :-"
1190 GOSUB 600
1200 IF K$=CHR$(13) THEN 1220
1210 H2$=H2$+K$ : Z$=Z$+K$ : IF LEN(Z$)>7 THEN 1220 ELSE 1190 .
1220 CSAVEM Z$,1024,1535,1024
1230 FOR X=1 TO 10 : SOUND10*X,1
1240 NEXT X : Z$="" : Z2=ZZ
1250 RETURN
```

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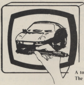

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Firmware

Brian Cadge explores the Dragon's ROM in a special series which builds up month by month into a firmware manual.

COS Firmware Routines

The following ROM routines form the Cassette operating system, and can be used from within assembly language programs, and to some extent, from within Basic programs. All routines should be called by the JSR command, and all addresses are again given in decimal. Where possible I have given the Tandy COCO (extended basic 1.1) equivalent address in brackets.

When calling any routine, assume that all registers may, potentially, be corrupted, unless stated otherwise.

Motor On

Dragon 48591 (Tandy 42954)

This routine turns on the motor relay by setting bit 3 of the I/O location $FF21. It counts down the delay given in locations 149/150 before returning. The default for this delay is about 0.5 seconds.

Motor Off

Dragon 48604 (Tandy 42987)

Turns off the cassette relay by clearing bit 3 of the I/O location $FF21, and returns immediately.

Audio On

Dragon 47852 (Tandy 43421)

On entry the B register must be zero for the routine to operate. The sound from the cassette port is channelled through the TV speaker. This is equivalent to the Basic Audio On command.

Audio Off

Dragon 47811 (Tandy 43380)

Disables the cassette sound to the TV speaker.

Write Leader

Dragon 32795 (Tandy 42968)

Writes a leader out to the cassette, also switches on the motor relay by calling the Motor On routine. The leader consists of a number of bytes of $55. The number of bytes written can be changed by the user (see memory map)

Write 1st Block

Dragon 47505 (Tandy 42981)

Writes a leader by calling the write leader routine, and then writes a block by calling the 'Block Out' routine. It is necessary to set up the memory locations needed for the 'Block Out' routine before entering this routine.

Byte Out

Dragon 48658 (Tandy 43050)

Write the byte in the A register to tape. This routine can be used to write your own customised cassette operating system if required.

Block Out

Dragon 47513 (Tandy 42996)

Writes a block of data out to the cassette. The cassette motor must be turned on first (this is left on after the 'write first block' routine, so use this). The output buffer address must be set up in locations 126/127 and the length of data to be written (if other than 255) should be set up in location 125 before entering the routine.

Write Basic

Dragon 46757 (Tandy 42089)

Writes the current Basic program to tape in tokenised form. The filename should be stored in locations 466-473, and the filename length in location 465. The action of this routine is similar to CSAVE.

Write Binary

Dragon 31995 (Tandy 33597)

This routine will produce a complete binary file on tape, suitable for loading into Basic using the CLOADM command, or back into an assembly program using other routines, such as 'Read Binary'. It is unusual in that the JMP command is used to enter it, rather than the JSR command. The return address should be pushed on to the stack as the first item, followed by the start address of the data, the end address of the data, and the entry address. The start and entry addresses should also be stored in locations 487/488 and 485/486. These can differ from those pushed on to the stack if it is required to load the file at an address other than that from which it was saved. Again, the filename is also set up before calling the routine (see memory map).

Close Files

Dragon 46687 (Tandy 42025)

Closes any open cassette stream. This has the action of 'flushing' the cassette buffer and writing an EOF block to tape. No action is taken if the cassette stream is not in use. This is similar to the CLOSE command in Basic.

Read Leader

Dragon 48615 (Tandy 42876)

Prepares the COS for reading. The cassette motor is turned on, and the routine waits for the leader tone. No data is actually read, and the motor is left on when this routine returns.

Bit In

Dragon 48549 (Tandy 42837)

Reads a single bit into the Z condition code. This routine forms part of the 'Byte In' routine and is of specialised use only on its own.

Byte In

Dragon 48557 (Tandy 42825)

Reads a single byte into the A register. This can be used in association with the 'Byte Out' routine to write your own Cassette operating system.

Block In

Dragon 47422 (Tandy 42763)

Reads a block of data into the cassette buffer (pointed to by locations 126/127). The various flags, such as EOF and Error, are updated. The Z condition code is cleared (BNE) if an error occured.

Read 1st Block

Dragon 47411 (Tandy 42753)

Calls the 'read leader' routine, and the 'block in' routine to get the filename block into the cassette buffer. The Z condition code is cleared (BNE) if an error occurred.

Find File

Dragon 47283 (Tandy 42625)

Searches tape for a filename matching that set up in 466-473. The tape will be positioned just before the first data block of the file on return, with the filename block in the cassette buffer.

Read Binary

Dragon 46920 (Tandy 42257)

This routine should be called after first calling the 'Find File' routine to read in the header and position the tape correctly. The routine is used to read in binary files, saved by the 'Write Binary' routine, or from basic using CSAVEM. On entry, the X register should contain the offset to be added to the load address in the header (locations 487/488); this will normally be zero. If the file type byte in the header is not set to 2 (binary file) then an FM error is produced.

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Doing the Splitz on your Dragon

***Peter Whittaker** wanted to have text and graphics on screen together, but without writing text to the graphic screen — here's how he managed it*

THERE HAVE been several routines published which will enable the mixing of text and graphics on the Dragon's graphics screen. However, they are all quite long, and are often complicated to use. Rather than following the trend of copying text to the graphics screen, I decided to try to get my Dragon to display both the Text mode and the Graphics mode at the same time. Furthermore, this was to be achieved with minimal disruption to the normal functioning of the computer.

The obvious way to start seemed to be by exploring the possibility of an interrupt driven routine. Every fiftieth of a second the computer interrupts what it is doing, and services the interrupt request. Then it returns to what it was doing before. By redirecting the interrupt routine to our own programs, we can insert a new dimension to the computer's performance. New sound routines can be written, or sprites can be added, and on this occasion, the display routine can be updated.

```
LISTING #1.
FLICKER SCREEN
10 CLEAR200,32500
20 FOR A=32501 TO 32558
30 READ B:POKE A,B
40 NEXT A
50 DATA 142,126,252,191,1,13,57,126
    ,126,255,134,192,183,255,34,183
    ,255,195,183,255,197,183,255,19
    9,142,127,23,191,126,253,182,25
    5,2,59,134,0,183,255,34,183,255
    ,194,183,255,196,183,255,198,14
    2,126,255,191,126,253,182,255,2
    ,59
60  EXEC 32501
70 PMODE3,1:PCLS
80 FOR A=8 TO 1 STEP -1
90 COLOR A
100 CIRCLE(125,91),A*10
110 PAINT(125,91),A,A
120 NEXT A
130 '(C) 1985 BY PETER WHITTAKER.
```

Listing #1 (Assembler 1) is a short interrupt driven routine. The program works by redirecting the interrupt vector at &H10D to the new routine. This interrupt would seem well suited for the task, because it is synchronised with the start of the television display. The interrupt occurs just before each time the television picture is renewed. This interrupt is called the Frame Sync Interrupt, or FI for short. This routine alternately selects the graphics and then the text modes, by changing the starting jump vector each time through the routine. When run, this program does indeed display both text and graphics modes together, and the normal operation of the computer does not seem to be affected. Commands can still be entered, programs can be loaded and saved, circles can still be drawn and filled in. However, the 50 cycles per second flicker of the screen is very distracting, and so the program is not adequate.

What is needed is a more frequent interrupt routine which will operate much faster than the 50 cycles per second of the screen display, and will enable us to change display modes half-way down the screen. By displaying the text screen for the first half of each fiftieth of a second, and the graphics screen for the second half, we should get a graphics window on the text screen. This fast interrupt is provided by the Horizontal Sync Interrupt, (HI) which when enabled will occur at the start of each of the 256 scan lines of the display every fiftieth of a second. That makes a total of 12800 interrupts per second. This interrupt is so frequent that there are only about 70 clock cycles between interrupt requests. The closer our routine gets to being 70 cycles long, the slower the computer becomes, until it spends all its time servicing interrupts, and has none left for its normal functioning.

Poke to clear	Poke to set	Function
$FFC0	$FFC1	Display mode 3 bit pattern
$FFC2	$FFC3	
$FFC4	$FFC5	
$FFC6	$FFC7	Display address offset 1½K steps 7 bit pattern
$FFC8	$FFC9	
$FFCA	$FFCB	
$FFCC	$FFCD	
$FFCE	$FFCF	
$FFD0	$FFD1	
$FFD2	$FFD3	

Table 2

However, once the routine gets longer than 70 cycles, as with SPLITZ, the computer will start to ignore some of the interrupts. Whilst it is still servicing one interrupt, it will ignore all further interrupt requests. Because of this, it has not been possible to count down the exact number

```
ASSEMBLER 1.   FLICKER SCREEN.

7EF5                 50       ORG
7EF5 8E7EFC          20 @START   LDX   #@ROUTINE  ..REDIRECT-
7EF8 BF010D          20       STX   $010D  ..........INTERUPT-
7EFB 39              20       RTS  ................ROUTINE.
7EFC 7E7EFF          30 @ROUTINE  JMP  @GRAF  .....VARIABLE JUMP.
7EFF 86C0            30 @GRAF  LDA  #$C0  .........SELECT FOR MODE.
7F01 B7FF22          30       STA   $FF22
7F04 B7FFC3          30       STA   $FFC3  ...........SELECT-
7F07 B7FFC5          30       STA   $FFC5  ...........DISPLAY-
7F0A B7FFC7          30       STA   $FFC7  ...........OFFSET.
7F0D 8E7F17          30       LDX   #@TEXT  .......SWAP VARIABLE-
7F10 BF7EFD          30       STX   @ROUTINE+1  ...JUMP.
7F13 B6FF02          35       LDA   $FF02  ........INTERUPT SERVICED.
7F16 3B              35       RTI  ...............QUIT  INTERUPT.
7F17 8600            40 @TEXT  LDA  #0  ........SELECT FOR DISPLAY.
7F19 B7FF22          40       STA   $FF22
7F1C B7FFC2          40       STA   $FFC2  ........SELECT-
7F1F B7FFC4          40       STA   $FFC4  ........DISPLAY-
7F22 B7FFC6          40       STA   $FFC6  ........OFFSET.
7F25 8E7EFF          40       LDX   #@GRAF  .......SWAP VARIABLE-
7F28 BF7EFD          40       STX   @ROUTINE+1  ....JUMP.
7F2B B6FF02          40       LDA   $FF02  ........INTERUPT SERVICED.
7F2E 3B              40       RTI  ...............QUIT.
7F2F                 50       END   @START
```

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	Johnny Reb		Draconian
	Roman Empire		Escape
	Warlord		Galactic Ambush
	Tyrant of Athens		Glaxxons
BAMBI	Amazing		Intergalactic Force
SOFTEK	Ultrapede		Moon Hopper
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of screen lines before changing the display mode. Instead a process of trial and error has been used to obtain the timing for the display.

Splitz Explanation

The routine (Assembler #2) is initialised by @START. This redirects the interrupt vector at &H010D to the @ENABLE routine, and then finishes. The next interrupt is directed to @ENABLE, where the interrupt vector is again redirected to the main program at @ROUTINE, and the high speed Horizontal Sync Interrupt is enabled by ORing &HFF01 with Binary 00000001. This ensures that the routine will be synchronised with the television display. The program then returns from the interrupt. Interrupts will now occur 12800 times per second, and will be directed to @ROUTINE. Here a counter is incremented (@COUNT) and if it is not yet time to change display mode, the interrupt will finish.

If it is time to change display mode, the program will jump (@BRANCH) to the relevant section of the code (@TOP or @BOTTOM). Here it will select and POKE to the relevant registers the numbers required to set up the display. (See Table 1.) Then it will change the jump command at @BRANCH, by substituting the address of the other routine. Finally, the timer is reset, and then the interrupt is finished until the next time. Before returning from the interrupt, the computer must read the registers at &HFF00 and &HFF02. These tell the computer that the HI and FI

Table 1

Code address	Effect in program
$7F29 $7F48	Display mode 0 - 255
$7F2F $7F32 $7F35	Graphics window offset &HC0 - &HD3
$7F4E $7F51 $7F54	Text screen offset &HC0 - &HD3
$7EF9	Colour of text screen -PCLS (1280 - 1535) eg 0, 85, 170, 255

```
ASSEMBLER 2.  SPLIT  SCREEN

7EF5              100     ART
7EF5 8E0500        20 @CLS  LDX  #1280
7EF8 8600          20     LDA  #0
7EFA A780          20 @LOOP  STA  ,X+
7EFC 8C0600        20     CMPX  #1536
7EFF 25F9          20     BLO  @LOOP
7F01 39            20     RTS
7F02 8E7F09        30 @START  LDX  #@ENABLE  REDIRECT THE -
7F05 BF010D        30     STX  $010D  .......INTERUPT ROUTINE. (FI)
7F08 39            30     RTS
7F09 8E7F1B        40 @ENABLE  LDX  #@ROUTINE
7F0C BF010D        40     STX  $010D
7F0F B6FF01        40     LDA  $FF01  .......ENABLE THE -
7F12 8A01          40     ORA  #1  ..........HORIZONTAL SYNC (HI) -
7F14 B7FF01        40     STA  $FF01  .......INTERUPT.
7F17 B6FF02        40     LDA  $FF02  .......FI SERVICED.
7F1A 3B            40     RTI  ..............QUIT  INTERUPT.
7F1B 7C7F67        50 @ROUTINE  INC  @COUNT  INCREMENT TIMER.
7F1E B67F67        50     LDA  @COUNT  ......GET TIMER.
7F21 8158          50     CMPA  #88  ........IS IT TIME -
7F23 2538          50     BLO  @EXIT  .......TO CHANGE DISPLAY.
7F25 7E7F28        50 @BRANCH  JMP  @TOP  ...VARIABLE JUMP ADDRESS.
7F28 86C0          60 @TOP  LDA  #$C0  ......SELECT FOR MODE.
7F2A B7FF22        60     STA  $FF22
7F2D B7FFC3        60     STA  $FFC3  .......SELECT -
7F30 B7FFC5        60     STA  $FFC5  .......DISPLAY -
7F33 B7FFC6        60     STA  $FFC6  .......OFFSET.
7F36 8E7F47        60     LDX  #@BOTOM  .....CHANGE THE -
7F39 BF7F26        60     STX  @BRANCH+1  ...VARIABLE JUMP.
7F3C 7F7F67        60     CLR  @COUNT  ......RESET -
7F3F 7C7F67        60     INC  @COUNT  ......THE
7F42 7C7F67        61     INC  @COUNT  ......TIMER.
7F45 2019          61     BRA  @EXIT  .......QUIT ROUTINE.
7F47 8607          70 @BOTOM  LDA  #7  ......SELECT FOR TEXT.
7F49 B7FF22        70     STA  $FF22
7F4C B7FFC2        70     STA  $FFC2
7F4F B7FFC4        70     STA  $FFC4
7F52 B7FFC6        70     STA  $FFC6
7F55 8E7F28        70     LDX  #@TOP  .......RESET THE -
7F58 BF7F26        70     STX  @BRANCH+1  ...VARIABLE JUMP.
7F5B 7F7F67        70     CLR  @COUNT  ......RESET TIMER.
7F5E 2000          70     BRA  @EXIT  .......QUIT ROUTINE.
7F60 B6FF02        80 @EXIT  LDA  $FF02  ....FRAME SYNC AND -
7F63 B6FF00        80     LDA  $FF00  .......HORIZONTAL SYNC -
7F66 3B            80     RTI  ..............BOTH  SERVICED.
7F67 0000          90 @COUNT  FCC  0,0  .....TIMER.
7F69              100     END  @START
```

interrupts have been serviced, and that the next interrupt request can be serviced. If these registers are not read from before the interrupt is finished, then the computer will not service any more interrupt requests.

When run, this program will successfully split the screen in half. The top half will display the text screen, and the bottom half the PMODE3,1 graphics screen. Fig #1 gives the memory layout of the new display screen. It can be seen that only half of the text screen is displayed as text, whilst the other half appears as a thin band of graphics display at the top of graphics page #1. This produces two problems. The first is that when we CLS the text screen we also put some ugly characters on the top of the graphics display, and secondly, whenever the computer prints below the eighth line of the display, we cannot read it. The first problem is easily solved. Assembler #2 includes a short fill routine, @CLS, which will fill in the bottom half of the text screen with the appropriate colour to match the graphics screen. Substituting values of 0, 85, 170, and 255 at location &H7EF9 will change the colour filled in. The routine is called by EXEC&H7EF5 (32501).

Assembler #3 provides the solution for the second problem. By inserting a JMP command at location 359, we can intercept the ROM's print routine, and divert it to our own before letting it continue. If the next character to be printed would move the cursor onto the ninth line of the text screen, the screen is first scrolled, and the eighth line is blanked out before the routine returns to the ROM routine to print the character. Now all text printed will be restricted to the text window, and will not interfere with the graphics display.

The next modification to the program is to include an exit routine. This program (Assembler #4) will stop the Horizontal Sync Interrupt by ANDing &HFF01 with binary 11111110. Then it resets the Frame Sync Interrupt vector at &H010D to its normal value, and disconnects the print modification routine. When called, EXEC&H7FC0 this program will cancel the SPLITZ program, and the computer will return to normal functioning. The final alteration to make is to include a short initialisation routine to tie all these routines together. Assembler #4 includes @INITIALISE (EXEC&H7FE6) which does just this, and is used to set up the routine and display the SPLITZ screen. SPLITZ can be reconnected at any time by EXEC32742.

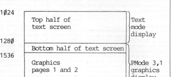

Figure 1

```
ASSEMBLER #3.  PRINT ROUTINE.

7F70                 1070      PRT
7F70 8E7F7C          1010 @START   LDX  #@ROUTINE
7F73 BF0168          1010      STX  360  ....REDIRECT
7F76 867E            1010      LDA  #$7E  ....ROM PRINT
7F78 B70167          1010      STA  359  ....ROUTINE
7F7B 39              1010      RTS
7F7C 3416            1020 @ROUTINE  PSHS  X,D  ....SAVE REGISTERS
7F7E BE0088          1020      LDX  $88  ....GET CURSOR POSITION
7F81 810D            1020      CMPA  #13  ....CHECK FOR LINEFEED
7F83 2707            1020      BEQ  @LINEFEED  ....AND BRANCH
7F85 8C04FF          1030 @CHARACTER  CMPX  #1279  ....END OF EIGHTH LINE
7F88 2526            1030      BLO  @EXIT  ....IF NOT QUIT
7F8A 2005            1030      BRA  @SCROLL  ....OR SCROLL SCREEN
7F8C 8C04E0          1040 @LINEFEED  CMPX  #1248  ....ON EIGHTH LINE
7F8F 251F            1040      BLO  @EXIT  ....IF NOT QUIT
7F91 8E0400          1050 @SCROLL  LDX  #1024  ....TOP OF SCREEN
7F94 EC8820          1050 @LOOP1  LDD  32,X  ....NEXT LINE
7F97 ED81            1050      STD  ,X++  ....COPY UP
7F99 8C04E0          1050      CMPX  #1249  ....EIGHTH LINE COPIED
7F9C 25F6            1050      BLO  @LOOP1  ....IF NOT LOOP
7F9E 8660            1050      LDA  #96  ....BLANK
7FA0 A780            1050 @LOOP2  STA  ,X+  ....OUT
7FA2 8C0500          1050      CMPX  #1280  ....EIGHTH
7FA5 25F9            1050      BLO  @LOOP2  ....LINE
7FA7 BE0088          1055      LDX  $88  ....DECREMENT
7FAA 3088E0          1055      LEAX  -32,X  ....CURSOR TO
7FAD BF0088          1055      STX  $88  ....SEVENTH LINE.
7FB0 3516            1060 @EXIT  PULS  X,D  ....RESTORE REGISTERS
7FB2 39              1060      RTS  ....RETURN  TO ROM PRINT ROUTINE
7FB3                 1070      END  @START
```

Program Alterations

Listing #2 includes all three machine code routines (2-4), and a BASIC demonstration program. Once the workings of the routines are fully understood, the demonstration program.

Once the workings of the routines are fully understood, the demonstration section can be deleted (lines 140 to end), and the loader alone kept for future use.

Table 2 gives a list of addresses and values which will alter the display produced, and effect the area of memory displayed.

As listed the program will not work properly with the Dragon DOS connected. The DOS workspace will intrude on the graphics window.

It should be possible to convert the program, by changing the display offset to start at #3072 instead of #1024, and rewriting the print routine to copy text up into higher memory. However, the conversion will not be perfect, for the text displayed will be a part of the graphics memory, and so be subject to intrusion by graphics commands.

The machine code can be saved by 'CSAVEM "SPLITS", 32500, &H7ECE, &H7FE6'. Remember to CLEAR 200, 32500 before loading, and be warned that using the PLAY or SOUND commands will cause the system to crash beyond recovery.

Good luck — and try experimenting with SPLITZ.

```
ASSEMBLER #4.  QUIT ROUTINE.

7FC0                 2070      PRT
7FC0 8E7FC7          2010 @START  LDX  #@ROUTINE  ....REDIRECT
7FC3 BF010D          2010      STX  $010D  ....INTERUPT
7FC6 39              2010      RTS  ....VECTOR
7FC7 8E9D3D          2020 @ROUTINE  LDX  #$9D3D  ....RESTORE ORIGINAL
7FCA BF010D          2020      STX  $010D  ....INTERUPT VECTOR
7FCD B6FF01          2020      LDA  $FF01  ....CANCEL HI
7FD0 84FE            2020      ANDA  #254  ....BY ANDING
7FD2 B7FF01          2020      STA  $FF01  ....$FF01 WITH BINARY 11111110
7FD5 8639            2030      LDA  #57  ....DISCONNECT
7FD7 B70167          2030      STA  359  ....PRINT ROUTINE
7FDA B6FF02          2040      LDA  $FF02  ....HI AND FI
7FDD B6FF00          2040      LDA  $FF00  ....BOTH SERVICED
7FE0 3B              2040      RTI  ....QUIT  ROUTINE
7FE6                 2050      ORG  $7FE6
7FE6 BD7F02          2060 @INITIALISE  JSR  $7F02  ....INSTALL SPLITZ
7FE9 7E7F70          2060      JMP  $7F70  ....INSTALL PRINT ROUTINE
7FEC                 2070      END  @START
```

Listing 2 — Splitz demonstration

```
LISTING #2.
SPLITZ DEMO.
10 CLS0
20 '*****MACHINE CODE LOADER*****
30 CLEAR200,32500
40 FOR A=32501 TO 32748
50 READ B:POKE A,B
60 NEXT A
70 DATA 142,5,0,134,0,167,128,140,6
   ,0,37,249,57,142,127,9,191,1,13
   ,57,142,127,27,191,1,13,182,255
   ,1,138,1,183,255,1,182,255,2,59

80 DATA 124,127,103,182,127,103,129
   ,88,37,59,126,127,40,134,192,18
   3,255,34,183,255,195,183,255,19
   7,183,255,198,142,127,71,191,12
   7,38,127,127,103
90 DATA 124,127,103,124,127,103,32,
    25,134,7,183,255,34,183,255,194
    ,183,255,196,183,255,198,142,12
    7,40,191,127,38,127,127,103,32,
    0,182,255
100 DATA 2,182,255,0,59,20,0,0,0,0,
    251,251,251,251,142,127,124,191
    ,1,104,134,126,183,1,103,57,52,
    22,190,0,136,129,13,39,7,140,4,
    255,37
110 DATA 38,32,5,140,4,224,37,31,14
    2,4,0,236,136,32,237,129,140,4,
    224,37,246,134,96,167,128,140,5
    ,0,37,249,190,0,136,48,136,224,
    191,0
120 DATA 136,53,22,57,4,255,255,255
    ,255,4,4,4,4,255,255,255,255,14
    2,127,199,191,1,13,57,142,157,6
    1,191,1,13,182,255,1,132,254,18
    3,255,1
130 DATA 134,57,183,1,103,182,255,2
    ,182,255,0,59,0,0,0,251,251,189
    ,127,2,126,127,112,251
140 '*******DEMO PROGRAM*******
150 CLS
160 PMODE3,1:PCLS
170 PRINT@12,"SPLITZ":PRINT:PRINT"
    EASY TEXT AND GRAPHICS UTILITY"
    :PRINTTAB(7)"BY PETER WHITTAKER
    "
180 PRINT:PRINTTAB(9)"DEMONSTRATION
    "
190 FOR A=4 TO 1 STEP -1
200 COLOR A
210 CIRCLE(125,45),A*10
220 PAINT(125,45),A,A
230 NEXT A
240 EXEC&H7FE6:EXEC32501
250 GOSUB380
260 PRINT:PRINT"BECAUSE SOME ROM RO
    UTINES AFFECTTHE INTERUPT SYSTE
    M, THE SPLIT  SCREEN WILL OCCAS
    IONALY BE       THROWN OFF BALAN
    CE. HOWEVER, IT WILL QUICKLY RE
    TURN TO NORMAL.":GOSUB380
270 PRINT:PRINT:PRINT"Please note t
    hat the sound and  Play command
    s will cause the    system to c
    rash beyond recovery.":GOSUB380

280 PRINT:PRINT"THE GRAPHICS DISPLA
    Y MODE CAN BECHANGED BY POKING
    TO &H7F29.   GRAPHICS MODES 3
    AND 4, COLOUR  SETS 0 AND 1 CAN
     BE DISPLAYED,  AS WELL AS SEVE
    RAL OTHER MODES.":GOSUB380
290 PRINT:PRINT:PRINT:PRINT"PMODE3,
    1 - COLOUR SET 1":PRINT:PRINT"P
    OKE&H7F29,173":PRINT:POKE&H7F29
    ,173:GOSUB380
300 PRINT:PRINT:PRINT:PRINT"PMODE4,
    1 - COLOUR SET 0":PRINT:PRINT"P
    OKE&H7F29,245":PRINT:POKE&H7F29
    ,245:GOSUB380
310 PRINT:PRINT:PRINT:PRINT"PMODE4,
    1 - COLOUR SET 1":PRINT:PRINT"P
    OKE&H7F29,255":PRINT:POKE&H7F29
    ,255:GOSUB380
320 PRINT:PRINT:PRINT:PRINT:PRINT:P
    RINT:PRINT"AND ALL THE REST....
    ...":GOSUB380:FOR A=0 TO 255:PO
    KE &H7F29,A:NEXT A:POKE&H7F29,1
    64
330 PRINT:PRINT:PRINT:PRINT:PRINT:P
    RINT:PRINT:PRINT"THE TEXT SCREE
    N MAY ALSO BE     CHANGED, BY P
    OKEING TO &H7F48.":PRINTTAB(8)"
    <PRESS ANY KEY>":EXEC41194:FOR
    A=0 TO 255:POKE &H7F48,A:NEXT A

340 POKE&H7F48,7:FOR A=0 TO 255:POK
    EA+1024,A:NEXT
350 EXEC41194:PRINT@7,"TEXT AND GRA
    PHICS";:PRINT@42,"-<SPLITZ>-";:
    PRINT@231,"BY PETER WHITTAKER";

360 EXEC41194:EXEC&H7FC0:CLS:PRINT"
    ROUTINE DISCONNECTED......":PRI
    NT"EXEC&H7FE6 TO RECONNECT SPLI
    TZ":END
370 STOP
380 PRINTTAB(8)"<PRESS ANY KEY>":EX
    EC41194:RETURN
390 '(C) 1985 PETER WHITTAKER.
```

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Some commands in the Editor section are: Mirror, Invert, Left, Right, Slice, Swap colour, Move fonts, Data dump (screen and/or printer) and Test in different Pmodes.
The Animator Test Menu contains options for speed, Direction of travel, Start from font number, and Repeat after font number, as well as Display mode.
The Scenario Menu has commands to Clear Paper, Select colour and Pmode, Fill, Draw, Copy parts of picture, Remove selected colours etc.
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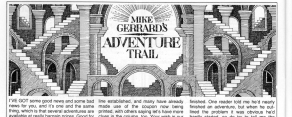

MIKE GERRARD'S ADVENTURE TRAIL

I'VE GOT some good news and some bad news for you, and it's one and the same thing, which is that several adventures are available at really bargain prices. Good for the pocket, but not such a good sign for future Dragon adventures being published. I see that Microdeal has taken over a range of Salamander titles, and these include the adventures *Franklin's Tomb, Lost in Space, Wings of War* and *Cricklewood Incident*. All these are well worth the £1.99 being asked for them, though if you bung off a cheque there's also a 75p postage charge per order. If you're at all interested in writing your own adventures then you might also consider getting Microdeal's own *Rainbow Writer*, which has just been reduced from £19.95 to £4.95. This allows you to easily redefine the character set to produce something like the small print style used in the Mysterious Adventures series.

Adventurer's Club

If you've seen the advertisements from John Penn Discount Software you'll have noticed some bargains going there, too. For £1.50 you can find *Black Sanctum, Pettigrew's Diary* and *Mystery of the Java Star*. Smaller discounts are available on a wide range of adventures from an organisation I first mentioned a couple of months ago, The Adventurer's Club Ltd, at 64c Menelik Road, London NW2 3RH. The price cuts are generally little more than £1, but they do offer all the Adventure International range, as well as Nemesis and Incentive titles, plus the infamous *El Diablero* at £1.49 including postage. You have to be a member, of course, and as I've now seen the second and third of their monthly dossiers I can recommend them even more than I did a couple of months ago. Both dossiers run to 20 pages, and as well as in-depth looks at old favourites like *Valhalla, Sherlock, The Hobbit, Zork* and *El Diablero,* there are plenty of new reviews, a letters page, swaps page, news, a competition, a help line and an adventure-writing feature. Thanks to reader Richard Marshall of Tunbridge Wells for sending me the dossiers, and for reporting how pleased he is with the club.

Richard had asked me how to open the tool chest in *Caverns of Doom,* which is done by: NOTE LEKS EHTR AEND NUOF YEKE HTGN ISU. Quite a few readers have said how keen they are to see a help line established, and many have already made use of the coupon now being printed, with others saying let's have more clues in the column, too. Your wish is our command, oh readers, so if you have a simple question on one adventure then use the coupon, or if it's a complicated question then write to me, and also let me know your clues, bugs and your boasts about adventures completed.

First in with some solutions to problems is Robert Field of Hillcrest, Sandford Avenue, Church Stretton, Shropshire SY6 7AB. In *Shenanigans,* Robert says, to get past the snake: NAM OWE HTGN IVOM YBKC ORMA HSEH TTEG. In *Mountains of Ket* to avoid the Dragon: PMAR EHTN OLIO RUOP. To find the black box in *Wings of War;* RALL ECNI RET AWNI GORF PORD. Ah, so that's what you do with the gorf, thank you Robert. He also wants to know is where he can buy *El Diablero* and *Madness and the Minotaur*. The former he can buy from Microdeal, but sadly *Madness* doesn't seem to be available at the moment. Perhaps some reader might be interested in doing a swap with Richard, who's successfully completed several adventures, or perhaps some enterprising software house might make *Madness* available again.

Jan van Sivis of 51 Forge Road, Little Sutton, South Wirral L66 3SG is stuck in *Sea Quest,* wanting to know what the metal detector is for and also how to get past the pirate. I've had more than one reader unable to pass the persistent pirate, who likes a drop of the hard stuff. But where to find the hard stuff? EVAC TAHT GID TSUJ! The metal detector, Jan, is for using, naturally enough, but again the main question is where? Well, in two places, actually, one not too far from where you first find it, the other somewhere else where the ground might be soft enough to dig in if the detector gives you a response. Jan offers help on *Black Sanctum* and *Calixto Island,* in exchange for help on *Shenanigans,* where he says he's floundering a little, though his letter wasn't specific enough to enable me to help. That's a point worth making, as readers do sometimes write in with a very vague question which is impossible to answer. It's difficult to help if all that you know is that the reader's stuck in the adventure, or that they're wandering around, or they can hardly get started, or they've nearly finished. One reader told me he'd nearly finished an adventure, but when he outlined the problem it was obvious he'd hardly started, so do try to tell me the obstacle you can't get past or the object you can't find a use for.

Frustrated Hulk

It also helps if you give a name and address. Someone has written to me with problems on *The Hulk* and *Ra-Aktu.* I don't know the second adventure, but even if I did I could hardly address the answers to "A very frustated Hulk." I suppose we could ask every postman in the country to look out for a large green person owning a Dragon computer, but it might take a while. It's surprising how many readers write in with two problems in the same adventure, with both problems being related. Mark Gadsby asks in *Shenanigans:* "I can't get past the snake because I can't find the shamrock, and what use is the woman in the field?" Those two problems are connected, and the answer's been given above, but can anyone help Mark on the following: (1) In *El Diablero,* how to get past the tunnels after pushing down the wall and killing the spirit slave; (2) In *Madness and the Minotaur,* where to find the urn with the oil: and (3) In *Syzygy,* how to kill the alien and how to find a space-suit with no holes in it. Help to Mark at 157 Pinewood Park, Cove, Farnborough, Hants GU14 9LE.

Syzygy is confounding lots of people, including David R. Hunt at 16 Harfield Gardens, Grove Lane, London SE5 8DB. "How can you fight against Darth Vader and win?" Indeed, I only wish I knew, and the sooner some reader can tell me, the better. David offers some help on *Caverns of Doom,* advising you not to use the flashlight early on, if at all possible, as you will need this later when swimming under water. If you weren't aware that there was any swimming to be done, incidentally, then: AERAN RETS EWNI LLAW GNIL BMUR CENI MAXE. David has various questions on various adventures, so I've put him in touch with various experts, but one of his questions I'll deal with here, and that's how to get past the wall that's in mint condition in *Mountains of Ket:* OLO PYAS DNAD NAWY RRAC.

No problems on *The Ket Trilogy* for Bet Hall, who completed all three in three weeks. If you'd had a Spectrum when the adventure first came out, Bet, you might have won yourself the video recorder. Bet lives at 37 Caxton Close, Hartley, Dartford, Kent DA3 7DG, and offers help on *Ket* as well as *Cimmeon Moon, Death Mines of Sirus, El Diablero,* and several others which I've managed to complete myself so won't list here. Bet's struggling on *Return of the Ring,* however, being "bored with killing endless mutants and looking for an oracle and a stone." Help to Bet in Dartford, and if you're asking for help, which obviously applies when writing to anyone, do remember to enclose a stamped, addressed envelope. You might not think it matters, as you're only sending out one letter, but it makes a lot of difference to the person receiving ten or twenty or even more.

Mathew Lodge of Northwich in Cheshire is proving himself to be a regular bug-hunter. After scoring 101% in *Mountains of Ket,* he's discovered a way of getting round the feature in *The Cricklewood Incident* which won't allow you to QUIT. Normally it says, "No, I won't let you," and as Mathew points out this can be a bit of a pain if you do want to start afresh. But he discovered that if you type in a string of 30 characters with no spaces and obviously not commencing with a recognisable word, then the program scrolls up, crashes with an error, but then auto-runs again from the start.

I've now typed up Paul Watson's solution to *Cricklewood,* so if anyone wants a copy of that then send me a stamped addressed envelope, but remember it's a solution to the game and not merely a help sheet, so be careful how you make use of it.

No new releases this month, as you will have realised by now, but let's finish on a little bit of good news which I've just heard. Quickbeam Software will be publishing a text adventure called *The Wierd of Kesh,* which reader Bob Aldridge of Enfield sent in to me a while ago. Bob wrote it the hard way, using a book called *Exploring Adventures on the Commodore 64* by some writer named Peter Gerrard (never heard of him.) Bob acutally developed the program under the Dragon DOS system, and as soon as he's made the changes that Quickbeam has asked for then I'll be reviewing it pronto. It's hoped that it will be ready in time for the next 6809 Show, so perhaps some of you will see it there. Perhaps I might see some of you there. Where to find me? KNI RDAE MYUB NEHT RABE HTNI KOOL. ■

Adventure Contact

To help puzzled adventurers further, we are instituting an Adventure Helpline — simply fill in the coupon below, stating the name of the adventure, your problem and your name and address, and send it to Dragon User Adventure Helpline, 12/13 Little Newport Stret, London WC2H 7PP. As soon as enough entries have arrived, we will start printing them in the magazine.

Don't worry — you'll still have Adventure Trail to write to as well!

Adventure ....

Problem..

....

Name ....

Address..

.... **Oct 85**

Adventure Contact

Adventure Calixto Island **Problem** On reaching the native ceremonial ground I am stuck on how to continue **Name** Sean Upson **Address** 28 Atherley Road, Shanklin, Isle of Wight

Adventure Return of the Ring **Problem** Cannot breathe on Forest Moon and cannot find anything to help me; can't get blue pass **Name** Neil Huggins **Address** 6 Monmouth Court, Hendrepenny, Caerphilly, Mid Glamorgan, South Wales

Adventure Pettigrews Diary **Problem** How do you get a job and how to you get into the Euroconk Hotel **Name** Paul Marlow **Address** 50 Lime Avenue, Bentley, Walsall, West Midlands WS2 0JP

Adventure Sea Quest **Problem** I can do quite a lot on Sea Quest but I can't find a key to open the trapdoor in the beach house **Name** Scott Maddin **Address** 34 Almond Place, Brimington, Chesterfield, Derbyshire

Adventure Syzygy **Problem** I have already got a hint sheet, but can't find out how to kill the huge ugly alien and get the sabre **Name** P A Ravencroft **Address** 40 Cedar Road, Willenhall, West Midlands WV13 3BZ

Adventure Madness and the Minotaur **Problem** No light to get down the stairs; can't get to the forest **Name** K Miller **Address** 25 Rannoch Road, Redhouse Estate, Sunderland, Tyne and Wear SR5 5EU

Adventure Poseidon Adventure **Problem** How to get out of the first three rooms of the ship **Name** Vic James **Address** 8 Landsdowne Road, Alton, Hants GU34 2HB

Adventure Return of the Ring **Problem** How do you get the moon walker? What is a tracker? **Name** Graham Wright **Address** 17 Sharston Crescent, Knutsford, Cheshire

Adventure Ket Trilogy — Temple of Vran **Problem** How do you get to the large doors in the hillside **Name** Gerard Purnell **Address** 35 Murton Lane, Newton, Mumbles, Swansea SA3 4TR

Adventure Ket Trilogy (Part One) **Problem** How to get past the zombie once I have got past the skull **Name** Michael Cooper **Address** 53 Old Lonsdon Road, Patcham, Brighton BN1 8YA

Adventure Sea Quest **Problem** Where is the diamond ring? **Name** Duncan Lawrence **Address** 18 Dovey Close, Barry, South Glamorgan CF6 8BH

Adventure Shenanigans **Problem** I can't get out of jail; I can't read the sign outside the bedroom window **Name** Leon Bynoe **Address** 13 Belvedere Road, Darlington, Co Durham DL1 5EP

Adventure Calixto Island **Problem** How do you get past the natives? What use is the shovel? **Name** Anthony Fine **Address** 12 Woodward Avenue, Hendon, London NW4 4NY

Adventure Williamsburg and Wings of War **Problem** I can't get into the church in Williamsburg, and I can't get back to Blighty in Wings of War **Name** David Kelsall **Address** Woodtop Farm, Goosnargh, Preston, Lancs PR3 2ER.

Adventure Return of the Ring **Problem** How do you get the key off the genie? Where is the book of skulls? **Name** David Hadfield **Address** 26 Meadow Avenue, Preesall, near Blackpool.

Adventure Syzygy **Problem** Most of it **Name** Jan van Sivis **Address** 51 Forge Road, Little Sutton, South Wirral L66 3SG.

Adventure Return of the Ring **Problem** How do I get the chest open in Halm's Temple **Name** Marcus Handford **Address** 3 Maplemeade, King's Drive, Bishopstown, Bristol BS7 8JG.

Adventure El Diablero **Problem** I can't get out of the yellow tunnel — I've pushed the wall but can't do anything else **Name** Paul Spittlehouse **Address** 41 Barley Garth, Burton Pidsea, near Hull HU12 9AF.

Adventure Black Sanctum **Problem** Can't find the claw hammer **Name** Kevin Gibbs **Address** 8 Lewis Terrace, Penydarren, Merthyr Tydfil, Mid Glam CF47 9LH.

Adventure The Hulk and Ra-Aktu **Problem** How to get past the ants and how to get out of the room with scratches on the walls **Name** Christopher Tattersall **Address** 28 Wetherby Road, Trentham, Stoke-on-Trent ST4 8AZ.

Adventure El Diablero **Problem** Getting out of shaft after killing slave **Name** K Money **Address** 12 Stowen Street, Hereford HR1 2PL.

Adventure Return of the Ring **Problem** How can I survive the Forest Moon? I can't breathe there **Name** Ole Kristian Julseth **Address** Fidjebakken 30, 4600 Kristiansand, Norway.

Adventure Madness and Minotaur **Problem** Where is the mushroom I need to learn the first spell? **Name** Rodger Dick **Address** 21 North Road, Saline, Fife.

Game for a laugh

Program: *The Games Cassette*, Datacom, 407F Hockley Centre, Birmingham B18 6NF
Price: £3.95

THIS IS supposed to be the best compilation tape on the market. Judging by the standards of the others that is probably a fact, but is not a boast!

This tape contains nine Basic games and a program advertising other Datacom products. I will talk about my general impressions first and then say a few brief words about each game in turn.

The programmers at Datacom are quite obviously masters of the graphic page. All the games containing graphics have the most beautifully designed text on the hi-res screen, and some fantastic background pictures.

Sadly the games themselves are so totally unoriginal the only surprises come when you find out that "Landing at the alien base at noon on the day of the Gruumsh worshipping ceremony" is actually a game which involves a helicopter descending over a city and having to bomb said city away to enable landing!!! This is the major problem — the games are executed brilliantly but so what? They're only fun when they are played with two or more people and even then there's nothing here that amateur programmers couldn't write themselves.

Execution is a glorified version of hangman, nice graphics, but fails to create any sense of excitement.

Snail Pace is a good game for more than one person but it's a shame there's no option to set the number of races at the meeting. Forget it for a solo game.

Interplanetary Trader has a nice internal logic but gimmicks like the abysmal space shoot-out ruin it.

Atom Hunt: The board game (*Black Box*) is a much better idea; this game doesn't really work on a computer.

Empire: Ever heard of a game called *Kingdom?*

Hilo is in my opinion the best game on the cassette. I really enjoy playing this in competition, but I hate playing it solo.

Air Assault: Landing at the alien base at noon on the day of the Gruumsh worshiping ceremony.

Wumpus Mansion. A real let down, as it plays for far too long on the text screen; but my sister loved it (there's no accounting for taste!).

Wipeout. This version of *Snake* is presented fantastically and plays awfully, or should that be looks awful and plays well?

Jason Orbaum

Screen Dumper

Program: *Dumper*, MacGowan Consultants, 6 Arnhem Drive, Caythorpe, Nr Grantham, Lincs.
Price: £5.50

DUMPER is a sophisticated screen dump program from MacGowan Consultants, the company that produces *Printer Control*. The copy reviewed here was configured for the Epson printer, but MacGowan can supply a copy suitable for use with almost any printer, given the appropriate control codes for graphics on/off etc.

The tape contains two programs. A Basic program is first loaded in and run; this loads in the machine code screen dumper and copies it to low memory. You can then save a copy to your own tape at the default position at the top of memory, or at a different place. This is particularly useful for Dragon 64 owners, who want to use the program in 64 mode. As well as operating on the Dragon 32 and Dragon 64 (in either mode), the program is also compatible with Dragondos. The Basic program has an option to save to disk but MacGowan has made the classic mistake of typing in the program without DOS attached, so that all you get is a Syntax error if you try to use this option. The answer is to type EDIT 300, and press ENTER, which tokenizes the line correctly.

Dumper is accessed from within your own Basic programs using the USR function, with a command string similar to that used in the PLAY and DRAW commands. Various parameters can be changed, such as Margins, Density, Section of screen to be copied, number of copies etc. All of these parameters have useful default values, and can be reset by the X command.

For example, the string "SC1EC32SL1EL24" would produce a straight forward dump of the current screen (as set by the Pmode command). Screen dumps can either be horizontal or vertical, with sizes of 1, 2, 4 or 8. If this all sounds familiar then that is because the options available are almost identical to those in the *Printer Control* program.

The documentation supplied consisted of two sides of text explaining how to load, copy and use the program, as well as some useful information for users who want to access *Dumper* from within their own machine code programs.

This is certainly the most powerful machine code, stand alone, screen dump program I have seen and it only occupies 1K of RAM. However, even at £5, I can't help but feel that most users already have adequate screen dump programs for their printers — several have appeared on the pages of *Dragon User*. But if you have one of those printers for which nobody seems to have a screen dump, then MacGowan could be your answer!

Brian Cadge

Bubble Busters!

Program: *Bubble Buster*, Microdeal, 41 Truro Road, St Austell, Cornwall, PL25 5JE
Price: £1.99

THIS IS the second of two games that set you up at the bottom of the screen as a catcher trying to catch the falling objects. This is the version that works quite well.

The screen display is neat and clear, with the multi levelled catcher at the bottom and the bubbles lined up at the top ready to fall.

Play commences nicely and the movement of the catcher is a very good form of proportionality. Proportional movement means basically that the catcher or rocket or whatever your caracter in a game is will come to rest in a position directly proportional to the position of the joystick in its frame within the boundaries of the dimensions of movement of the object.

Directional movement on the other hand allows you to direct a force onto the object to make it move in the direction shown (however not all games obey the laws of physics — some objects tend to stop after the force is released!).

This game has proportional movement but does not jump from position to position; it chooses instead to glide, covering all intermediate points making control more precise if slower.

Sadly, however, this is not a good game — it just hasn't got what it takes. It is not challenging enough, and has no sophistication.

Another one for the growing EEC mountain of naff games.

Jason Orbaum

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If you've got a technical question write to Brian Cadge. Please do not send a SAE as Brian cannot guarantee to answer individual inquiries.

Dragon Answers

Acid test

I HAVE written a basic program for my son, who is a chemistry student, to determine the chemical term pH.

I am, however, unable to express all of the number to a base 10 — ie to determine the Log10.

Is there a simple function on my Dragon which will do this, or is there a mathematical expression which I can put into a DIY function?

J S Pagington
74 Kingsley Road
Northampton NN2 7BL

THE DRAGON has no built in function for calculating logarithms to the base 10; the LOG function works to the base 'e'.

The following user defined function can be used to return the base 10 logarithm of a value.
10 DEF FNL (X) = LOG (X)/LOG (10)

The function is used within the program as follows:
100 V=FNL (A): REM V equals the base 10 log of A

64 mode

I HAVE owned a Dragon 32 for some time, but I have recently exchanged it for a 64. Every game I have has loaded into my new machine perfectly, until I tried to load a machine-code routine in '64 mode' (by typing 'EXEC 48000' beforehand). The game *loaded* immaculately, but stuck on the title screen. At first, I thought that the fault was in the game, but after trying with several other games, I diagnosed that the fault was in the computer. As the manual says that only cartridges will not work in '64 mode', please could you explain the fault, and maybe a way around it.

Thomas Carter
Tyn-y-Cae
Mamhilad
Pontypool
Gwent NP4 0JD

THE POINT about the '64 mode' is that all the ROM routines are copied into RAM starting at 49152, rather than at the normal ROM position of 32768. This gives you 16K of extra memory from Basic.

If a machine code program uses ROM routines it will jump to the position where the routine would be in the '32 mode', but as the routine is no longer there the program will crash. The idea behind the '32 mode' on the 64 was to make all software written for the 32 compatible.

As there is no advantage in using machine code programs written for the 32 in 64 mode — indeed they will probably crash — stick to using the '32 mode' for these.

Bit in?

I AM currently writing a different save/load program to the Basic Interpreter to beat the pirates. However, I am having trouble in putting the data to tape. What values do I have to poke to $FF20 when saving to indicate whether the bit is on or off? Do I have to poke any other address before saving, and will it be the same when I load it back in?

Both load and save programs are synchronised so data should not be lost during loading.

J Lailey
36 Wyndham Road
Salisbury
Wilts SP1 3AB

THE VALUES that need to be put into $FF20 are stored in the ROM between $BE44 and $BE68. For a zero bit each value is output, for a one bit every other value is output. The 'Bit In' routine can be used to read the bit value back into the carry, and this starts at 48549.

Perhaps a better way to write your own cassette routines is to use the more reliable 'Byte Out' and 'Byte In' routines, which start at 48658 and 48557 respectively. Both of these use the A register.

Edge pins

I PRESENTLY own a Dragon 32 with a single disk drive operating under Dragondos. I have the opportunity of buying a second-hand drive. Could you tell me the pin connections from the Dragondos cartridge to the drive?

S Garratt
Nuneaton

LOOKING down on the edge connector of the Dragondos cartridge, the odd numbered lines are all on the upper side and are all ground. The even numbered lines are on the under side, with pin 2 to 34 running from right to left.

These lines are the standard 5in disk drive connections. You will need to know the following to use a second drive: 8=INDEX, 10=Drive 0, 12=Drive 1, 16=MOTOR, 18=DIRECTION, 20=STEP, 22=WRITE DATA, 24=WRITE GATE, 26=TRACK 0, 28=WRITE PROTECT, 30=READ DATA, 32=SIDE 1.

Line 34 is used by drives with a 'Ready' line, and is not connected on Dragondos.

Put on

I AM having trouble with the GET and PUT instructions. Powerful as they are, I cannot find a way of PUTting on to the screen and having the effect of an exclusive OR parameter. Can you please help.

I Sanson
Rickmansworth

UNFORTUNATELY, there is not an XOR option to the GET/PUT command, which is a shame as this would probably be the most useful of all. The nearest you can get is to GET the area of screen where your object is to be put into a temporary array, then PUT the object there using the OR option. Finally, to remove it PUT the original back from the temporary array using the PSET option. This is not as fast as a simple XOR option would have been, but it does the job.

OM error

I HAVE had my Dragon 32 for 13 months now and am very pleased with it.

But lately when trying to load some games in, the computer comes up with OM ERROR. If I type in PRINT MEM when first switching the computer on, it comes up with 8487.

The games are brand new and have no faults in them. I have tried waiting for the powerpack to heat up before loading anything, but it still comes up with 8487 instead of 24000.

E Ryder
Cayton
Scarborough

WHEN switched on, part of the initialisation routine tries to work out how much memory you have in the computer, it does not just assume 32K. It does this by trying to change the value in each location, until it comes to one which cannot be changed; this is assumed to be the end of RAM (normally 32768 — ROM).

If your Dragon reports only 8487 free bytes on switch on, then the problem is at least one faulty RAM byte, and the only answer is to consult a qualified Dragon engineer. I suggest you consult the pages of Dragon User to find the one nearest you.

Listings

MY DRAGON 64 is a fairly recent acquisition which is providing some interesting and irritating features.

I often wish to visually check a long listing. This has proved to be difficult as the program lists at such a rapid speed. How can it be slowed down?

Peter F Cooper
68 Eastfield Drive
Pontefract
West Yorkshire WF8 2EZ

THE COMMONLY used 'quick and dirty' method to slow down the listing speed is to POKE 359,19 and if this is still too fast then add POKE 360,19 as well.

These pokes add a SYNC instruction in the Print routine which causes the processor to wait until the next interrupt occurs. The speed can be reset by poking the value 57 into these locations. Don't use these pokes with Dragondos or cartridges such as HIRES attached.

Classified

TOP TEAM FOR DRAGON 32/64 features include full match commentary, choice of team and tactics, group tables, extra time penalties, and signature tune. This is just the start! Highly addictive, you have been warned! £2.99. Also available for BBC 'B' and QL Universal software, 'Tanglewood', West Walberton Lane, Nr. Arundel, West Sussex. (024368-3722)

NEWCOPY provides back-up copies of headed and headerless machine code programs up to 29K, single key commands usable on multi-part programs, £2.50; Basic system page variables memory map. £1. SAE S. Mills, 49 Templegate Crescent, Leeds LS15 0EZ.

WANTED — Delta DOS + cable + manual for around £30. (0274) 583734 (Ian).

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DRAGON DISK DRIVE and controller with 10 disks, boxed as new, £150. Telephone Southampton 695236.

SHINWA CP80 PRINTER (reviewed Dragon User September 1984) with interface and paper, boxed as new, £150. Telephone Southampton 695236.

"ELECTRONIC AUTHOR" is THE machine code advanced word processor. Features include: automatic page numbering, centring, paragraphing; 51/64 × 24 true upper/lower case screen display with full screen editing; either WYSIWYG or let the computer arrange text and it's all VERY easy to use. JUSTIFIED TEXT, making your letters, documents etc, beautifully neat. Full block copy, delete included. Repeat key, excellent phrase search, change or delete facility. Fast typing, no missing out characters. Loading/saving rewritten to abolish I/O errors and allowing filenames of up to 20 characters. Comes with full documentation and configure program to allow it to run with ANY printer. DRAGONDOS VERSION NOW AVAILABLE!! Cost is £14.95 (cassette) or £19.95 (disk), payable to Smithson Computing, 24 Coal Hill Green, Leeds 13. Also we now supply printers at discount prices. Tel: (0532) 551631 for more details.

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Competition Corner

Answers to Competition Corner,
Dragon User, 12-13 Little Newport
Street, London WC2H 7PP.

CONSIDER the following program. Before reading further can you determine what it does? Allow yourself a time limit of one minute.

```
10 X=1: Y=1
20 PRINT X,Y
30 FOR N=1 TO 9
40 X=X+Y: PRINT X,
50 Y=X+Y: PRINT Y,
60 NEXT N
```

Full marks if you realised that the program generated the first twenty numbers in the series: 1, 1, 2, 3, 5, 8, 13, 21, . . . etc. Each successive number is found by adding together the preceding two numbers. The series so formed is called the 'Fibonacci' series after the man who first described it.

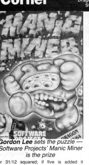
Fibonacci — the name means 'son of Bonacci' — was probably the greatest mathematician of the Middle Ages, and was the pioneer of the Arabic decimal system of numerical notation as opposed to the cumbersome Roman system still in use in Italy at that time. Born in Pisa in the twelfth century, he received his education in Algeria where the Arabic number system was in use. In 1202 he published his best-known work, *Liber Abaci*, which contained all that was then known about arithmetic and algebra.

His skill at solving difficult and complex mathematical problems was often demonstrated publicly. At that time it was the custom for the leading mathematicians to compete in tournaments (rather like the top snooker players and chess Grand Masters of the present day). So great was Fibonacci's reputation that a team backed by Emperor Frederick II travelled to Pisa in 1225 to challenge Fibonacci to a contest. One of the questions solved by Fibonacci was: Find a square that remains a square if it is decreased or increased by five.

Obviously, the answer is not an integer, but it must be capable of being expressed in rational numbers (otherwise there would be an infinity of solutions).

Fibonacci found the number: 1681/144 or 41/12 squared.

If five is subtracted it becomes 961/144 or 31/12 squared; if five is added it becomes 2401/144 or 49/12 squared. It was fortunate that the difference given in the problem was five, as one, two, three, or four are incapable of solution!



***Gordon Lee** sets the puzzle — Software Projects' Manic Miner is the prize*

Although Fibonacci was the first to describe the series, he did not investigate its properties in any depth, and it was the Frenchman Edouard Lucas who gave the series its name and examined it in detail during the last century.

It will be readily seen that the series is rapidly divergent, — that is, it gets larger very quickly. Edit line 30 of the program to: 30 FOR N = 1 TO 22 and it will be seen that the 45th number of the series causes a switch to exponential notation.

There are many curious properties relating to this series. For example, apart from the trivial case of 1, the only number in the series that is a perfect square is 144, and, curiously, this is the *twelfth* number in the series. The only cubes in the series are 1 and 8. The square of any Fibonacci number is either one more or one less than the product of the preceding and following numbers. The sequence of final digits repeats in cycles of 60. Every third number in the series is divisible by 2, every fourth by 3, every fifth by 5, every sixth by 8, and so on, the divisors being themselves the Fibonacci series.

Perhaps the most surprising property can be shown if we again modify our program. Edit lines 40 and 50 as follows:

```
40 X=X+Y: PRINT X, X/Y
50 Y=X+Y: PRINT Y, Y/X
```

This will now also print out the value of each number in the series divided by the number immediately below it. If the program is run it can be seen that this very rapidly converges to a value of 1.61803399.. — the 'golden' number. This is a number which itself possesses many strange properties. It is the only positive number which becomes its own reciprocal by subtracting 1. Also a rectangle having sides in the ratio of 1 : 1.61803399 . . . is said to be particularly aesthetically pleasing to look at, and is a ratio which is found in much classical art and architecture. If a sheet of paper with sides in this ratio is divided by a straight cut across its width so that the piece removed is exactly square, the remaining piece will also have sides in the same ratio, and so the process can, at least in theory, be continued *ad infinitum*.

As well as the Fibonacci series so far considered, an infinity of quasi-Fibonacci series can also be generated using *any* two positive integers as starting values. For example Edouard Lucas used the starting numbers 1 and 3 to generate the series 1, 3, 4, 7, 11, 18, . . . etc.

In order to jump on this band-wagon I have devised the 'Lee' series. Unlike the Fibonacci or Lucas series it is totally unremarkable except for one thing. The two starting numbers are the *lowest* possible that will produce, somewhere within the series, a value of one million.

This month's competition is to determine these two start values.

Prize

THIS MONTH, 20 copies of *Manic Miner*, the classic arcade game, can be won — courtesy of Software Projects.

Rules

TO WIN a copy of *Manic Miner*, you must first show the answer to the competition, and, secondly, demonstrate how you solved it with the use of a Basic program written on your Dragon.

Please do not send in a cassette containing your answer.

Make sure your name and address are clearly printed on your entry and mark the envelope October competition. Envelopes which do not say which month you are entering for will be disqualified.

As a tiebreaker, complete the following sentence in 10 words or less: "*Manic Miner* is the game for me because . . ."

Entries must reach *Dragon User* by the last working day in October. The winners will be announced in the January 1986 issue. The editor's decision is final and no correspondence will be entered into.

July Winners

TWENTY lucky — or skilful — Dragon User readers have won themselves copies of *Rommel's Revenge* from Design Design.

They are E Taylor of Liskeard, Terry Potter of Chiseldon, Andrew Carnet of Cleveland, P Jamieson of Stockton-on-Tees, B Chamberlain of Banbury, P Matthews of Bognor Regis, Jon Collins of Langley Village, Mike Evans of Hadleigh, J Leyland of Barkston, S Holt of Bacup, P Bennington of Strood, R Wilson of Basingstoke, F Taylor of Acklam, M Edwards of Welwyn Garden City, S Clayton of Bessacarr, E Hasted of Erith, R Woods of Ilford, Volker Schatz of Feldafing, J Isherwood of Newquay and K Townsend of Alsager.

The answer, by the way, was 55555.

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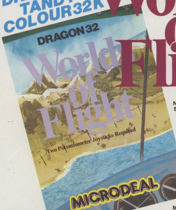
Worlds of Flight



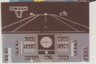
Not a Game.... A very realistic Flight Simulation!!!!

Worlds Of Flight (W.O.F.) is a "view" orientated flight simulation for the Dragon 32 and Tandy colour 32k computers, – written entirely in machine language.

"View" orientated means that the pilot may determine his or her position by actually viewing the surrounding landmarks and features as opposed to flying on instruments only.

The craft is a light weight, low winged, single engined aeroplane, with a nose wheel which is both steerable and retractable.

Most instrument manoeuvres and procedures may be practised, as well as aerobatics which include, aileron rolls, spins, stalls and sustained inverted flight.



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